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Syllabus

TECHNOLOGY FOR HIGHER EDUCATION

JULY/AUGUST 2004 • VOL. 17, NO. 12 • WWW.SYLLABUS.COM

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Learning Management Systems

A Conversation with the Mellon Foundation's Ira Fuchs

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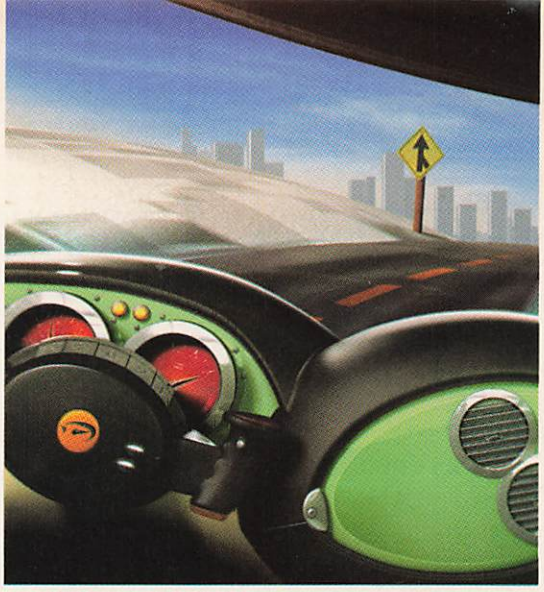
CONTENTS | JULY/AUGUST 2004



COVER STORY PAGE 14

Cover Illustration: Ryan Etter

FEATURES

14 **Learning Management Systems: Are We There Yet?**
An Interview with Ira Fuchs, Mellon Foundation
Learning management systems have come a long way since their first appearance on our campuses, but the coming years may see further evolution as open source initiatives like Sakai put tools for change in the hands all types of institutions. *Syllabus* asks about relevant Mellon-funded open source projects and the future of the LMS on campus.

26 **Online Course Development: What Does It Cost?**
Judith V. Boettcher, Designing for Learning and the University of Florida
Over the years, the acceptance and adoption of online courses has led to the growth of a digital infrastructure, allowing costs to be distibuted across the campus. Still, administrators must identify the true costs of designing and developing online courses.

22

35 **The Other Kids on the Block: Commercial Providers Grow Up in the eLearning Space**
The learning management systems market in higher education is often characterized as being dominated by a small handful of big players. Is there room for more? Find out how two commercial vendors, Unicon and Desire 2 Learn, plan to thrive in this challenging market.

40 **Managing Storage on Your LMS: Learning Objects**
Krishna P.C. Madhavan, Purdue University
As growing learning management systems and their associated digital materials put pressure on storage systems, can reusable learning objects help?

24

43 **Online Course Caps: A Survey**
Boris Vilic, Duquesne University
Institutions across the country participated in a survey revealing that raising online course caps may have adverse effects on students and faculty.

COLUMNS

10 Trends
Infectious Adoption
Phillip D. Long

22 Digital Tweed
Walls and Quads, Campus and Community
Kenneth C. Green

24 Campus Enterprise
E-Mail—The Killer App!
Annie Stunden

62 Reflections
What's Next: Course Creation Systems
Howard Strauss

DEPARTMENTS

8 Editor's Note
46 Case Studies
54 Buyer's Guide
59 Advertiser's Index

EDITOR'S NOTE

Mary Grush, Editor

Learning management systems are on a long journey. The technology that began with proprietary course authoring and classroom administration tools is now moving towards open learning platforms—environments populated with reusable content objects and integrated with campus information systems. Where are we in our travels? We're at a place where the best traditions of higher education meet, where collaborative development efforts and shared resources combine to provide a wider range of choices for individual institutions. In this issue, we look at where we are now with learning management systems and take a quick peek down the pike in the direction this technology may be headed.

Several open source projects centering on technologies related to learning management systems and eLearning platforms are currently funded, in whole or in part, by the Andrew W. Mellon Foundation. In our lead feature, "Learning Management Sytems: Are We There Yet?" (page 14), *Syllabus* speaks with Ira Fuchs, Mellon's vice president for research in information technology, about the future of the LMS and his vision for a potential open source software development and maintenance organization.

What will happen with market share among commercial vendors in the LMS space? In a challenging environment where "black box" strategies are certain to be undone and dominant players must adjust to open systems, how will eLearning companies that have entered this market compete? In "The Other Kids on the Block: Commercial Providers Grow Up in the eLearning Space" (page 35), *Syllabus* asks executives from two LMS vendors—Unicon and Desire 2 Learn—about their plans for success.

Widespread adoption and use of eLearning systems has influenced a change in the way administrators view technology spending. Many of the costs that used to be directly tied to online programs are now absorbed in "technology infrastructure" budgets. So, how do you identify costs associated with the design and development of online courses? Judith Boettcher provides some answers in "Online Course Development: What Does It Cost?" (page 26).

Other articles related to eLearning and the LMS include an examination of how learning objects can impact storage management (page 40) and a survey of online course caps (page 43). Finally, Howard Strauss rounds out our learning management systems issue with his Reflections column, "What's Next: Course Creation Systems" (page 62). Howard has a way of stating what *should* be obvious!

I hope by now you've made plans to attend Syllabus2004, to be held this year in downtown San Francisco July 18-22. If not, you can find conference information, including how to register, on page 31 of this magazine or on the Web at www.syllabus.com. We're very excited about our program this year—I look forward to seeing you there.

Enjoy this issue of *Syllabus*!

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail (mgrush@syllabus.com). We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Claudia Linh. If you are interested in writing for *Syllabus*, please send a brief description of your article idea along with writing samples to the editor at the above address.

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Assistant Editor Claudia Linh clinh@syllabus.com
Contributing Editor Linda Briggs
Columnists Kenneth C. Green
Phillip D. Long
Howard Strauss
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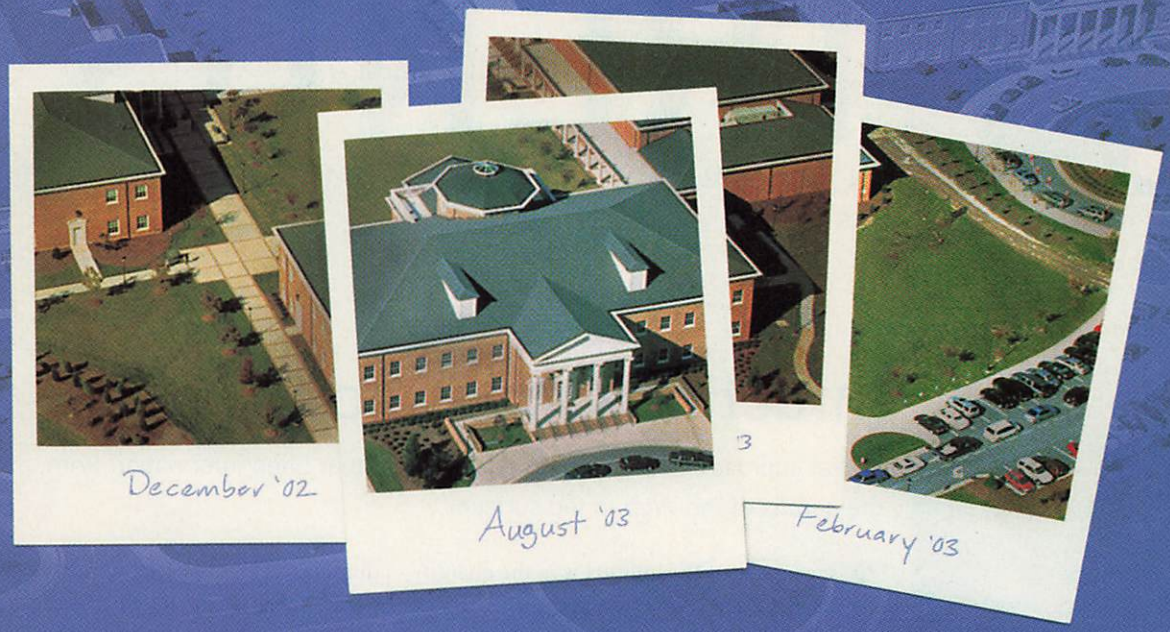

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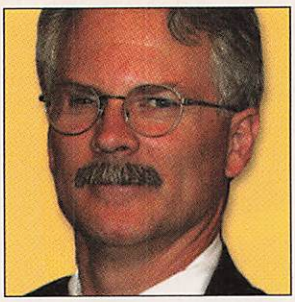

Phillip D. Long

TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

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- **Berkleemusic.com's** online school and Berklee Press, Berklee's publishing division, have experienced a 40 percent increase in visitors as a result of the launch of Berklee Shares and increased revenues of 32 percent, the school said.
- **Park University** with more than 21,000 students has selected eCollege for the institution's enterprise-wide use of eLearning technology for all online and on-campus programs.
- The San Diego Supercomputer Center (SDSC) at the **University of California** is opening a non-profit institute to develop "trustworthy" open source IT architectures and solutions to benefit life sciences and health.
- **Villanova University** plans to upgrade its campus-wide wireless system to handle voice, data, and messaging.

For these and other news stories, or to subscribe to our eNewsletters, Syllabus News Update, eLearning Dialogue, and Syllabus IT Trends, visit www.syllabus.com.

Infectious Adoption

A viral approach to distributing search tools that bring information from the depths of the Web to the surface

The beauty of the Internet is in the quantity of data that can be found on it. The bane of the Internet is that the vast majority isn't want you want. Search tools have made it easier for the user to find information, and they have been remarkably successful, at least if what you're looking for are basic products or services. Today's leading search tool has become so successful it has reached the status of a verb in colloquial speech ("Hey, let's 'Google' that and see what we find..."). Google makes finding things on the Web fast and efficient.

Of course, we know that the search robots, including Google's, can only discover a fraction of what is out on the net. The Internet's just too big. Further, much of what is on the Web is hidden from search engines—they require specific knowledge about how to find and interpret resources stored in local digital repositories. Different repositories use different methods to expose their contents.

Trying to pull everything together in one place may have been reasonable once, but not any more. Instead, it makes sense to offer various ways of giving some degree of structure to the content on the Web, particularly if the meaning and value the content provided is defined by specific communities of interest.

Making information about useful things accessible and getting it delivered to the communities that can really use it can be a circular challenge. It requires considerable effort to describe things so they can be found additional effort to build the infrastructure to conduct the searches in useful ways across data stores, and still more effort to make all of this easy to implement. User demand drives adoption, but getting to the point that users have something to *use* requires demand. Lowering the barrier to getting tools into the users' hands is the rock on which great ideas founder.

There are good technologies that have been in place for quite some time to help find information on the Web, but their very complexity has limited their value. Take z39.50, for example—a protocol for allowing records describing library holdings to be searched, and the results found communicated back to the user even when the data are in a system other than the one from which she is initiating the search. Libraries throughout higher education have largely adopted this technology making their online catalogs accessible to queries from users at other schools with different library systems. It works because the library automation vendor community has built this capability into online public access catalogs products.

As good as library holdings are, however, they are just a fraction of what is of potential

Hiding Resources from Search Engines

Search engines like Google or AltaVista won't pick up information about digital repositories because their robots don't implement the necessary interfaces, such as CGI, that bring the resource information to the Web. These resources are accessible only to those who know to look in specific digital library repositories, generally those at collaborating universities who are developing collections and have agreed upon a particular interface by which the data in these repositories can be exposed.

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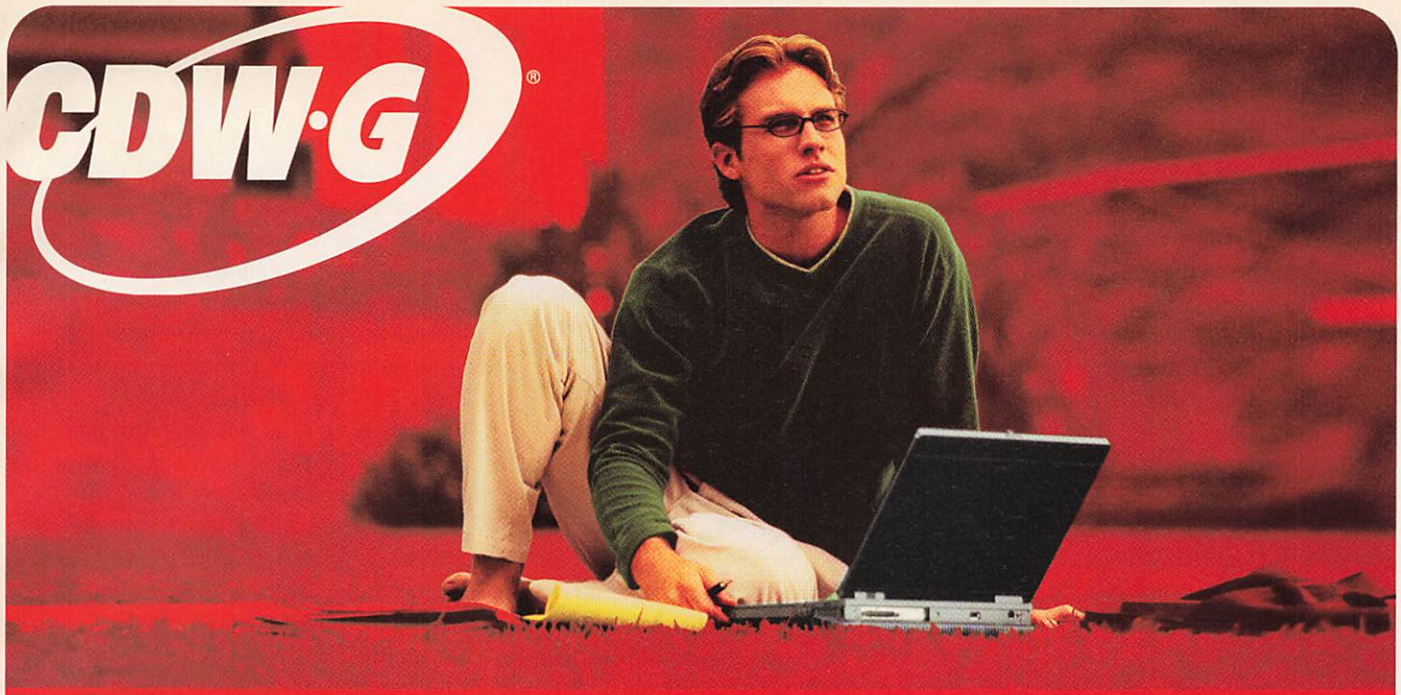

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interest out on the Internet. Hence, the benefit of something like z39.50 (or it's next-generation version) is restricted. Building a low threshold (easy to adopt) mechanism to get search interoperability would bring to the surface the intellectual richness that is out there, making it possible to mine the "deep Web."

Modeling Viral Infections As a Distribution System

A novel approach to the problem has been launched, modeled after viral infections—first you make something that is targeted for a host that is widely distributed in the population; then you make it incredibly easy to transmit it symbiotically, that is, in a way that does nothing to detract from the host's general health. It just adds a capability that some will find helpful (a positive selective advantage). If all goes well, you've jumpstarted dispersal of a new feature that will have staying power because it is low-cost, and high-value.

Apache and Mod_OAI

What is the most widely used Web server on the Internet today? If you answered *Apache*, you're right. Nearly 64 percent of Web sites worldwide are served up using Apache. There's the target host. One of the features of Apache that makes it so attractive is its ability to easily deploy new functionality through simple-to-install modules. These modules make it possible for Apache to take a request written for a scripting language, say Perl, and execute it. The mod_Perl module has added extraordinary flexibility to Apache Web servers. There are dozens of modules that add functionality to Apache's basic Web server (see http://httpd.apache.org/docs-2.0/mod/ for examples). There will soon be one more.

According to its mission statement, "The Open Archives Initiative (OAI) develops and promotes interoperability standards that aim to facilitate the efficient dissemination of content." Efficient dissemination of content is what we need, so this group is definitely addressing the problem. One of the tools that it has developed to help achieve this goal is the OAI-Protocol for Metadata Harvesting (OAI-PMH). OAI-PMH defines a mechanism for harvesting records containing metadata from digital repositories. The OAI-PMH gives a simple technical option for data providers to make their metadata available to services, based on the open standards HTTP (HyperText Transport Protocol) and XML (Extensible Markup Language). The metadata that is harvested may be in any format that is agreed upon by a community. [The unqualified Dublin Core metadata standard is specified to provide a basic level of interoperability.] Thus, metadata from many sources can be together in one database, and services can be provided based on this centrally harvested or "aggregated" data. Resources harvested by OAI-PMH are the kinds of in-depth technical and research and community-specific academic information that search bots like Google pass by.

Metadata:

"Data describing context, content, and structure of records and their management through time," that is, metadata describes properties of semi-structured data records. [From ISO 15489—1:2001, Information and Documentation—Records Management—Part 1: General]

http://www.iso.org/iso/en/CombinedQueryResult.CombinedQueryResult?queryString=15489

Tying It All Together: Low-Threshold Digital Searching of the Deep Web

With Apache servers as the host, the viral package to distribute is the high-performance federated digital search service based on OAI-PMH implemented as an Apache module, mod_OAI. Large amounts of data stored in digital repositories can then be found by students or faculty from their Web browsers, with minimal implementation overhead. What might this enable? From the browser of your choice you might be able to find articles, research reports, images of paintings from the Renaissance, or sound files of Woody Guthrie's original performances collected from the federated digital repositories of libraries around the Internet. All of this depends upon the continued hard work of creating the metadata that describes these resources, which librarians and information professionals are doing every day. They need more support for their valuable efforts, making what has been done accessible and useful reinforcing the value of this work and the ability for deep resources to surface.

Using Apache modules as the distribution mechanism to lower the adoption threshold for this technology. It's another example of how creative ideas, supported by insightful leadership from funding agencies, in this case the Andrew W. Mellon Foundation, are helping to shape the future of Web. It's a brilliant strategy, elegant in its simplicity, and powerful in its potential. The ratio of signal versus noise on the Net has just gotten higher.

Phil Long, Ph.D. (longpd@mit.edu) is senior strategist for the Academic Computing Enterprise at MIT. He is also a senior associate for the TLT Group of the AAHE.

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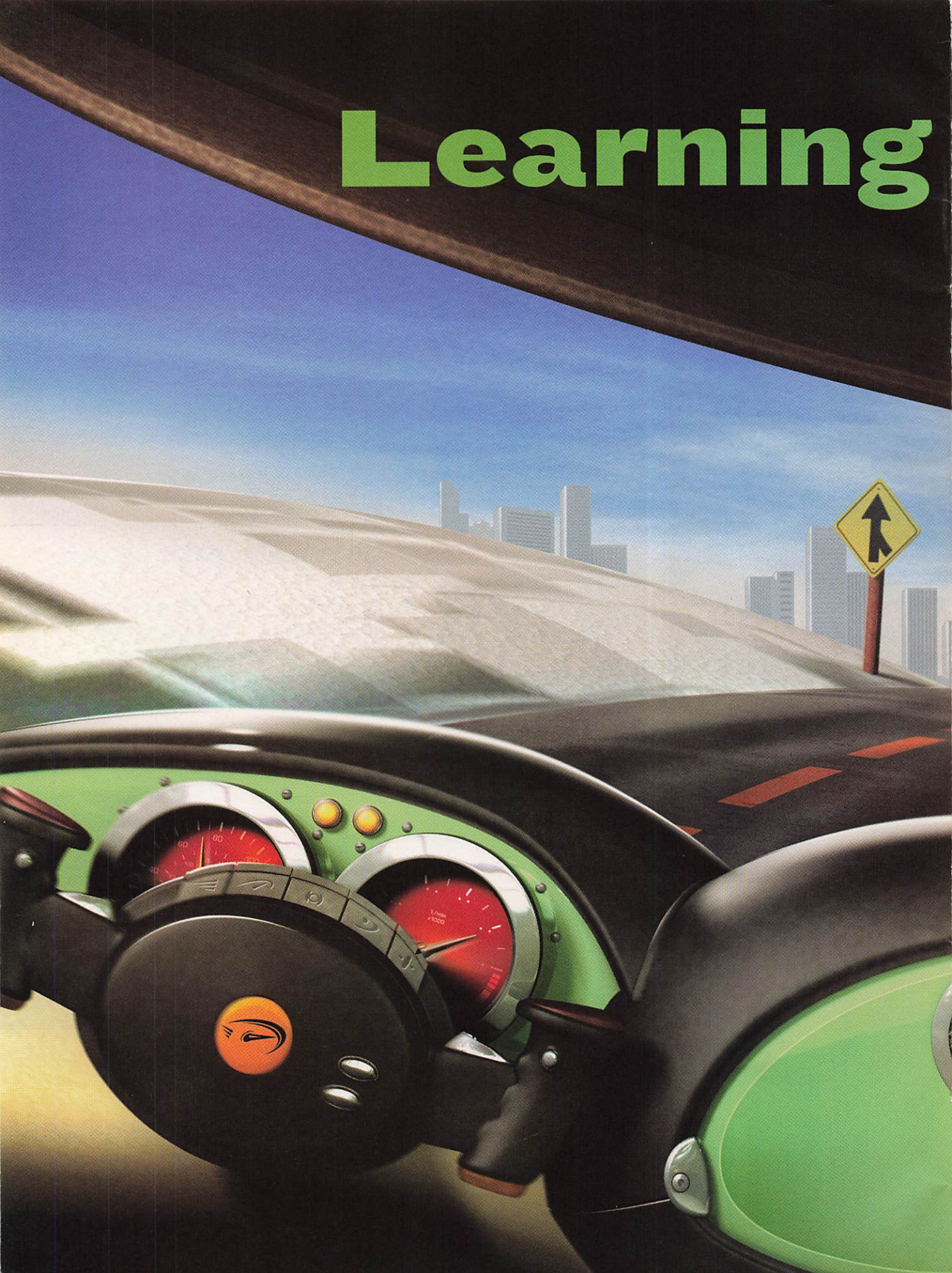
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Are We There Yet?

A Conversation with Ira Fuchs

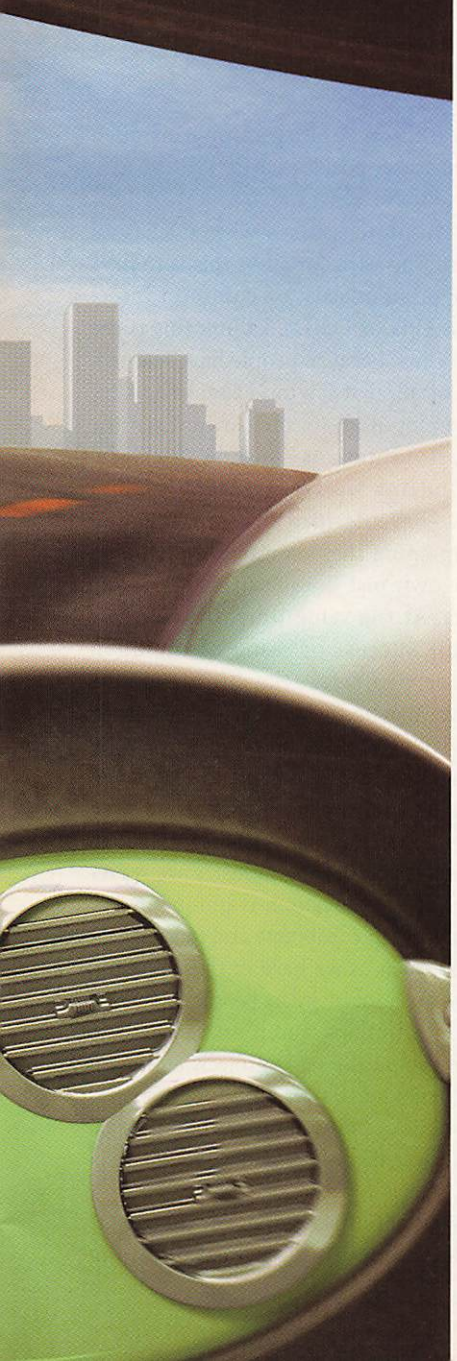


Illustration by Ryan Etter

The LMS has reached maturity but is racing to keep up with changing requirements on campus and to meet the need for integration with other enterprise systems and a more collaborative working environment. Reminiscent of the kids in the back of the car on your family's summer vacation, the persistent question about this technology seems to be, "Are we there yet?" *Syllabus* asked the Andrew W. Mellon Foundation's vice president for research in information technology about his vision for learning management systems and related technologies.

Syllabus: Where are learning management systems on Mellon's radar screen, and what kind of priority do they have?

Ira Fuchs: Learning management systems have been high on Mellon's radar screen ever since we made a grant to MIT in 2000 to support the OKI project. The purpose of OKI was to create a new framework to facilitate collaborative development of the components that comprise a modern learning management system.

That eventual goal is still in sharp contrast with where we are today. Now, if an institution acquires a commercial, proprietary LMS, and then finds that the system is deficient in some way, they often must wait until the vendor decides it is financially viable to develop the enhancement—an event that may never occur. Ideally what we're seeking is a situation in which the schools that want a new capability added to an LMS can, if they wish, develop it themselves, and then make it available to the higher education community so that others may benefit. That's the point of leveraging collaboration among institutions.

OKI focused on this framework and the delivery of a proof of concept, meaning a system or a pair of systems that could demonstrate this interoperability. And that's in

fact what MIT and Stanford achieved.

S: So OKI focused on the framework... how does the Sakai project build on that?

IHF: The Sakai project starts out where OKI left off by taking the architecture and the OSIDs [Open Services Interface Definitions] and fusing them with the best of breed development—learning management system development—from four major institutions: Stanford, MIT, Indiana University, and the University of Michigan. The purpose is to create a world-class production-ready system that will be open, extensible, and scalable. And, further, a very important aspect of Sakai is that the four institutions have agreed, in writing, as a condition of the grant, that they will bring this new system into production on each of their campuses at the same time, approximately a year from now. The goal is really nothing less than delivering an LMS that colleges and universities can use and extend with modules written at other schools, at their own school, or licensed from commercial vendors.

S: Do you think learning management systems will be considered a core technology for colleges and universities going forward? And will open, interoperable systems prevail and be in common use? Are we there yet?

IHF: I think learning management systems are a core technology already, and that fact is, I think, both good and bad. It's good because learning management systems have helped the faculty and students enormously. They make course information and content available on the Web, and at the same time improve communication among students and faculty. But because the LMS is already so important to the functioning of many schools, it's going to be hard to move away from the proprietary systems they may be running today and to begin using open, collaboratively developed and maintained systems. I think open systems are going to prevail, but it's going to take time.

S: So, in a sense, we're not really there yet...What are some of the steps that could move all of this forward?

IHF: That's true, we're not there yet. But Sakai is about to deliver a beta release. The concept is to leverage the work of many, many institutions to ultimately build a system that most, if not all, institutions will want to run. But that's not the case yet. Today, you have a plethora of choices among learning management systems. There are sites on the Web listing dozens of them. But for institutions seeking to move away from their current LMS, there is a cost to change. The cost comes in many forms, not the least of which is that people grow accustomed to an interface. And often they've converted content to be used in that system. So whatever we come up with is going to have to account for and minimize those costs of change.

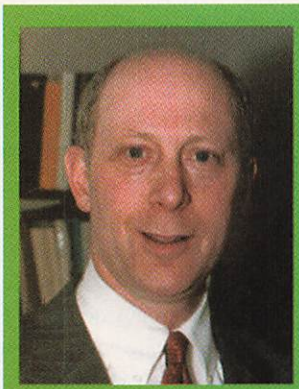
One way to minimize them is, for example, in the case of the user interface, to have what are commonly known as *skins*. These are modifiable user interfaces that are selectable by an institution, or sometimes even by the end user, to make the system look the way they want it to look. We're also going to need to have tools to facilitate the transformation of content from one system to another, to export it and then import it into another system. So we're going to have to do what we can to minimize the cost of converting from one system to another.

S: Is interoperability among installed systems a key goal for OKI?

IHF: Absolutely, that's what OKI is all about. The basis for all of this is to have a set of standards, of common interfaces, APIs or OSIDs. I think this is the right time, because people have learned, first of all, that it's too expensive to try to develop it all on their own. Even the biggest institutions—such as Michigan, the Indiana University, Stanford, and MIT—have decided that building and maintaining these complex systems on their own just doesn't make sense any more. At the same time, the notable, visible success of some of the open source projects—the big ones like Linux, Apache, or MySQL—have proven that it's possible to develop something in the open and get people to commit to maintain and enhance the software.

Perhaps the most important fact to remember is that the industry we represent, higher education, is unique in our willingness to collaborate and to share our labors, such as we have in this IT space. There are a lot of smart people in each of these institutions, and if we can harness them behind the same projects and use a set of standards, starting off with a good base piece of software such as I think Sakai will deliver, then we can do wonders.

S: What about standards for metadata? Is that something to consider along



Ira Fuchs

Ira Fuchs joined the Mellon Foundation in July 2000, in the newly created position of vice president for research in information technology. He is responsible for directing the foundation's expanding investigations of digital technologies that can be applied to teaching and research. Fuchs is also senior technology advisor to the president of Princeton University. From 1985 to 2000, he was vice president for computing and information technology at Princeton. In 1981 he founded the BITNET Network, the first and world's largest academic telecommunications network, later serving as president of its successor, the Corporation for Research and Educational Networking (CREN). He continues to serve as a trustee of JSTOR, a rapidly growing digital archive of more than 400 core scholarly journals.

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with the interface standards?

IHF: Sure it is, and that is something, of course, that the library community has been working on for a long time. What did someone once say?: "The wonderful thing about standards is there are always so many to choose from..." And we do have many metadata standards. But I think that they will converge, at least in limited domains. When it comes to learning object repositories, it's going to lead to a set of metadata schema, metadata standards that will not satisfy everyone—that's probably impossible—but will be good enough. Many of the Mellon-funded projects—OCW, Sakai, LionShare at Penn State, Chandler—are all trying to converge on a common standard for metadata.

S: Will learning management systems change significantly in the next few years? Have they been on the right track, and are they flexible enough to be used universally?

IHF: Learning management systems have come a long way, but there's still much that can be done to improve usability in particular, especially to make it easier to publish or create new material. It still takes too much expertise to create attractive materials from the notes, images, and programs that faculty use to teach a course. The proliferation of learning management systems suggests that no one system is sufficiently feature-rich, or adequately flexible and extensible enough to meet everyone's needs or even most institutions' requirements. But I hope to see that change in the next couple of years with the advent of Sakai.

S: Are new development tools needed?

IHF: Yes, I think we need authoring tools that lower the effort threshold dramatically for faculty to take digitized materials and create something esthetically pleasing as well as effective for their teaching purposes. There are tools, but we have to make sure that they are going to be compatible with all of the other pieces that we're putting together based on standards. Of course, they're not yet very compatible, but how could they be? They were built at some point in the past when people weren't worried about that.

S: What are the pieces needed so that learning management systems can become more easily or better integrated with other parts of the campus information system, either on the academic or on the administrative side?

IHF: We need the middleware layer that translates the standards, such as the OSIDs, for the actual campus infrastructures. For example, OKI defines a set of OSIDs for authentication and authorization, and we want developers to be able to use those OSIDs, so that the systems will be interoperable. However, just about every campus has some authentication system already in place, whether it's User ID/Password, or Kerberos, or Shibboleth. So there needs to be code which translates the calls that use the OSIDs, to the actual campus mechanisms. This is kind of a chicken-and-egg problem. Why create the middleware unless developers are using the standards? Why should developers use the standards unless the systems they are writing for have implemented the necessary middleware? But I think it's going to happen.

S: How do portals fit in with all of this?

IHF: There's another project, which was funded by the Mellon Foundation at almost the same time as OKI that has been very, very successful—that's uPortal. It's in use at scores of institutions now. It is the primary enterprise portal at those institutions. So when you ask the question about how to make it easier to integrate the LMS with other parts of the campus information system, I think uPortal is going to play an important role—and Sakai is built on top of uPortal.

S: Will libraries become better integrated with the LMS?

IHF: I think they must become better integrated in-so-far as making it as transparent as possible to the end user—faculty or the student—as to where the information used by the LMS is coming from or how to search for it. And that's a significant challenge since there are many potential sources for the data used in an LMS. A course can use data from online publishers, from the campus library, from another library, from the campus repository, or even from the faculty member's local or server-based files. With the emergence of peer-to-peer tools, such as LionShare, the data could even come from the personal machines of individuals throughout the world. Somehow we need to make all of this distributed information available in the learning management system without the user having to learn so many different interfaces.

S: What do you see happening with the development of discipline-specific repositories? Will that be in the purview of the libraries?

IHF: I think so. Repositories that house the scholarly output of an institution are starting to be developed, using software such as DSpace and Fedora, another two

The proliferation of learning management systems suggests that no one system is sufficiently feature-rich, or adequately flexible and extensible enough to meet everyone's needs or even most institutions' requirements.

projects receiving support from the Mellon Foundation. These are not discipline-specific initiatives, but it's likely that these repositories will be tied together using the Open Archives Initiative protocol for metadata harvesting, OAI-PMH, to create new sources of published materials. That could in turn have a very important impact on the existing publishing model for scholarly output.

S: What is the status of learning objects? Will they be widely adopted? What kind of timeline would you predict for a widespread adoption?

IHF: Widespread use and adoption of learning objects is one of those things that has been predicted to be, I think the three-letter acronym is *RSN*—"Real soon now," for a long time. All I can say is that technology is making it easier to package, search for, and utilize learning objects. But whether we will ever completely overcome the *NIH*, "Not invented here," obstacle, only time will tell. The early reviews of the OpenCourseWare initiative at MIT are encouraging and suggest that people do want to be able to borrow, share, and learn from other institutions' learning materials. For decades, one of the obstacles has been that while faculty may be willing to use another's textbook or chapter, it's been very hard to get them to use learning materials, because, after all, teaching is an intensely personal activity. But as we figure out how to package the object, as OCW is doing, I think we'll see much more sharing than we have in the past.

S: Will learning objects have an impact on commercial publishers, especially textbook publishers, and how will materials like electronic course packs be used with the learning management systems?

IHF: I envision textbooks that utilize technology in ways that go far beyond merely including a CD with a searchable text. I can imagine textbooks that are distributed digitally, read on a handheld reader with screens that can rival paper's readability. Sony recently announced a handheld device with a 200-pixel resolution instead of the 72-pixel resolution found on a standard monitor. That really starts to look like paper. And as storage capacities increase, you'll get more than the text of the textbook. You'll have videos of lectures. You'll have supporting materials. The LMS of the future will be a distribution point for the digital textbook. Electronic course packs, I think, will also be distributed via the LMS.

S: Are learning technologies and new media in synch? Can learning management systems incorporate new media such as streaming video effectively?

IHF: I think future learning management systems will make use of both one-way and two-way video. In terms of one-way video we are starting to see streamed video, for example, lectures in OCW for a limited number of courses, and they're very popular. At the Harvard Medical School, they routinely video all lectures in the first two years of study and make them available for viewing immediately after they are recorded. I hope that many of these recorded lectures are going to be made available freely on the Web in OCW-like repositories—a goal of OCW is to facilitate and foster at other campuses what they've done at MIT. I also think two-way video in the form of desktop video conferencing is going to become much more prevalent as the technology improves. However, one prerequisite for the effective use of two-way video is better end-to-end bandwidth and guaranteed quality of service (QoS)—both unfortunately are not common today on the Internet.

S: In terms of the commercial course management systems, how will they have to change in order to continue in that market? And is there room in the market for more players?

IHF: This a question that gets asked all the time, in relation to Sakai. With OKI the answer to questions about competition with commerical offerings was that we weren't really building a production system, only a proof of concept and a framework. But with Sakai it's no longer ambiguous. It's clear that the intent is to build a production-quality, open source, open standard, extensible system. That's what we want to do. And, so, I'll say what I've been saying for a long time. It's my hope that proprietary course management systems will, over time, be supplanted by open systems that facili-

Mellon-Funded Open Source Projects and Technologies

Below are useful links to some of the projects and technology development funded in full or in part by the Andrew W. Mellon Foundation. For more information about the foundation, see www.mellon.org.

Chandler: http://www.osafoundation.org/Chandler_Compelling_Vision.htm

DSpace: http://www.dspace.org

ePortfolios: http://www.theospi.org

FEDORA: http://www.fedora.info/

OpenCourseWare (OCW): http://ocw.mit.edu

OpenKnowledgeInitiative (OKI): http://web.mit.edu/oki/

LionShare: http://lionshare.its.psu.edu/main/

PKI : http://www.dartmouth.edu/~pkilab/

Sakai: http://www.sakaiproject.org/

uPortal: http://www.uportal.org

tate collaboration and sharing of both course materials and content, with software designed to extend the CMS itself.

I think there's still going to be plenty of room for commercial firms to develop and sell modules that fit into the open framework. I also think there will be a significant demand for services related to course management systems, including maintenance and custom enhancements. However, a new business model will be required. The model we have today is that you buy a software black box and you get tied to it. If you want extensions, you hope that they'll be in a future release. Further, there's no ability to leverage the brilliant minds on all our campuses to make these systems better. We want a different model, one in which we can collaborate among our campuses on improvements. I think there will continue to be opportunities for others who have a for-profit model to build a better mousetrap—provided it fits into the framework that we've developed so that we don't have to buy the whole package to get one piece that we like.

I think it is leading to the creation of an organization that will coordinate and provide funding for open source software projects...

S: You've talked about a lot of open source technology that is related to learning management systems. How will all of this—Sakai, LionShare, Chandler—be supported in the future?

IHF: Lack of reliable support is the issue that is mentioned most often as an obstacle to the widespread adoption of open source software in higher education. Let's look at some of the major open source, higher education-related projects underway today and see where those projects may be leading us.

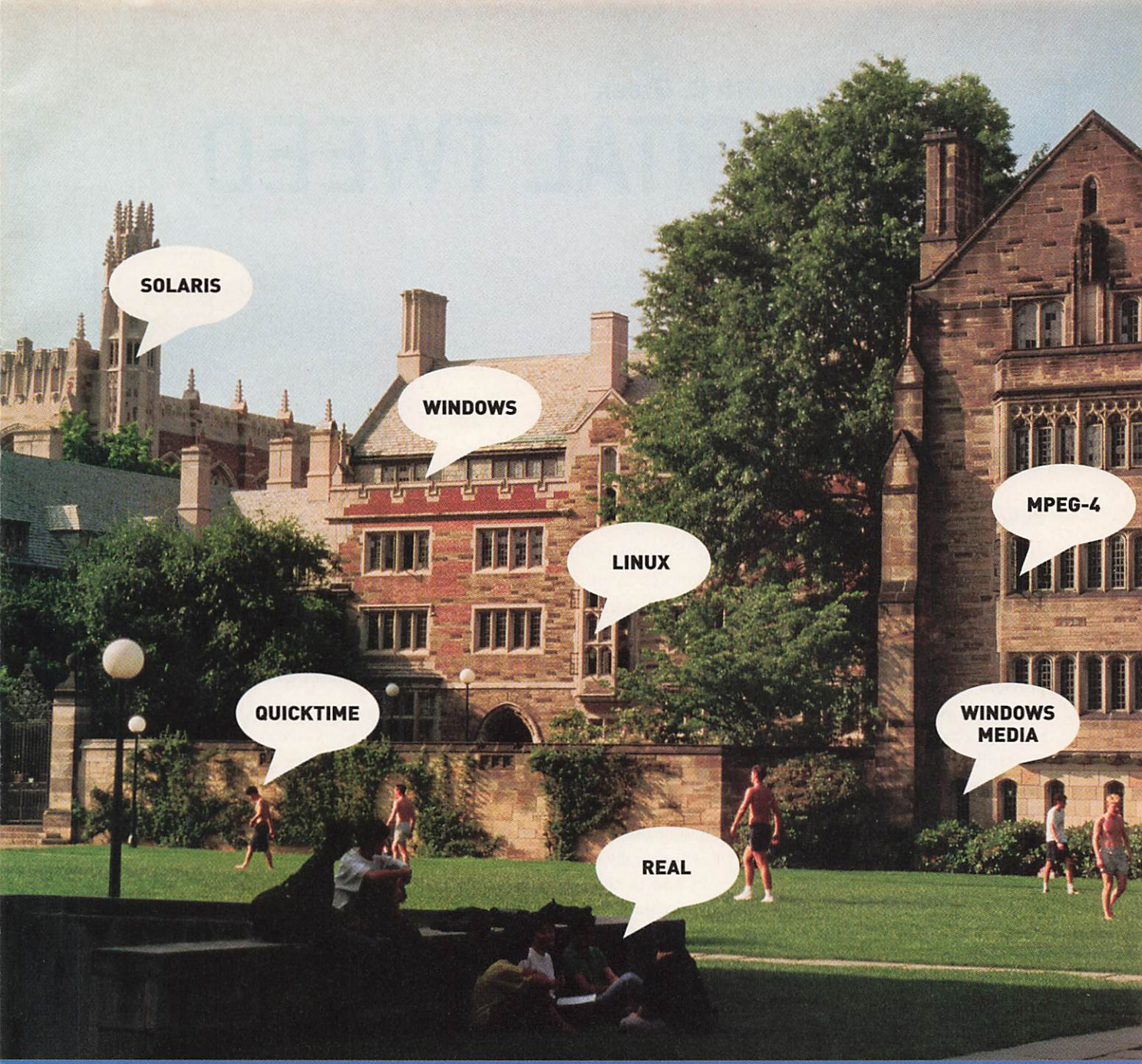
Consider the Chandler project, an initiative to create the next generation of personal information management tools, including enhanced e-mail, calendaring, and flexible links to all of the information we use on a daily basis. Chandler 's goals are ambitious but what really makes this project special is that it is being developed by the Open Source Applications Foundation (OSAF) led by Mitch Kapor, a software entrepreneur with an impressive track record of delivering quality software, and it is being supported by 25 major research universities—the members of the Common Solutions Group, each putting up $50,000. Their contributions are further leveraged by matching funds from the Mellon Foundation and the OSAF itself for a total of over $6 million in funding. In other words, these schools are outsourcing the development of open source software.

Then consider the Sakai project. Beyond the $2.4 million grant from Mellon, the four major institutions are collectively making an in-kind contribution of over $4 million in the form of staff that they are dedicating to the project and placing under the management of a joint board. In addition, they have created the Sakai Educational Partners Program (SEPP) and they have invited schools interested in the future of learning management systems and in particular the development of Sakai to participate in the project. Partner institutions contribute $10,000 per year over three years and in return receive early releases and significant input into the development of the system. Approximately fifty schools have signed up so far and we're hoping that as many as two hundred will join.

So, where is this leading? Assuming the success of these projects, I think it's all leading to the creation of an organization that will coordinate and provide funding for open source software projects to benefit higher education. I've given this organization the working name of Educore, similar in some ways to Bellcore, an organization that was created to serve the Baby Bells. I think people will see it as a natural next step. Looking at the success of Sakai, they may say, if you could do that, then why aren't you doing more? In a sense, we've got a set of dots, representing OKI, Sakai, LionShare, Chandler, and some of the other projects. Draw a line through the dots, and where does it lead? I think it leads to doing more in the same open, collaborative way, with a set of standards that ties all the pieces together. I think that Educore would be the natural progression, moving up one order of magnitude, from the series of initiatives that are underway today. If one to two thousand schools were each to contribute an average of $10,000—which is, by the way, less than they probably spend on one proprietary software package—you could then create an organization that could support 100-200 FTEs. With that level of funding, I believe it would be possible to attract the talent that would be necessary to both develop and maintain the key IT software needed by higher education including learning management systems, authorization/ authentication middleware, personal information management tools, and more.

S: What would the governance be? How will this be organized?

IHF: The question of governance is very important and would certainly have to be addressed, along with many other issues such as how to set Educore's priorities. There are also many models for open source software development in use today and Educore could coordinate projects that range from supporting lone developers at a university, to outsourcing to large centralized groups such as the one at OSAF or OSDL, to doing the work in-house. Educore would undoubtedly present many challenges but I think it is doable and of potentially enormous value to higher education.



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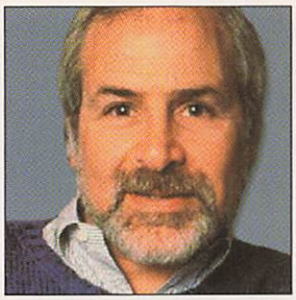

Kenneth C. Green

DIGITAL TWEED

Walls and Quads, Campus and Community

July. How will you spend your summer vacation? Work? Travel? Time with family and friends? Playing catch-up on sleep, reading, and project commitments? Trying to avoid phone, fax, and e-mail for a few weeks or maybe several months?

For many students and faculty, summer provides travel opportunities, often to Europe. If you are a committed (or aspiring) academic, the great European universities are typically a required stop on your tour. Sweatshirts from Europe's historic universities are comparatively inexpensive souvenirs and also a clever catalyst for subsequent campus conversations about "how I spent my summer vacation."

The architecture of the great European universities—institutions chartered centuries before the first class of nine students arrived in 1636 at the college that was to become Harvard—is striking. Thick stone walls often separate the campus from the city, reflecting the medieval role of the university as a place of learning and as a space isolated from city (and civic) life.

The architecture of American universities is a bit more porous. Yes, we have The Yard at Harvard, and Mr. Jefferson's Lawn at the University of Virginia, historic places defined by barriers and boundaries—gates at Harvard, green space at Virginia. But today, the walls that separate many colleges from their adjacent communities, especially in urban and metropolitan areas, are more metaphor than mortar.

Yet the barriers are real and have consequences, for campus and community alike. Many institutions are part of the town, but many are often remain unconnected to the community. Town/gown relationships can be serendipitous, but are often symbiotic.

If memory serves me well (always questionable), the industrial revolution fundamentally changed the nature and function of cities. For centuries, cities were centers of commerce, a place for people to meet and to barter: people brought their goods to the city. But the industrial revolution that began two centuries ago changed the nature of many cities from venues of commerce to centers of manufacturing.

It was during the industrial revolution that cities evolved into the venue where labor, capital, and material converged to create finished goods: garment factories in New York, steel in Cleveland and Pittsburgh, stockyards in Chicago, and auto factories in Detroit. These industries became the icons of their cities, the financial foundation for large segments of the population.

The transition from an industrial to an information society has taken a toll on many cities. Where mayors in the Northeast and Midwest once worried about the migration of manufacturing jobs to the Southern states, today mayors and governors across the country are concerned about the migration of manufacturing and technology jobs to venues outside of the United States.

University research centers across the country monitor this migration, routinely charting (and often bemoaning) the ebb and flow of industries and opportunity. Ironically, as older cities struggle with the loss of manufacturing jobs and the accompanying infrastructure decline, colleges and universities in these same cities are investing in information technology to rebuild (some would say reinvent) the campus infrastructure. While much of the money has gone for hardware and software, it is the campus network—initially wire, increasingly also wireless—that is the key element of the new digital campus infrastructure.

This institutional investment in IT infrastructure reflects, in part, campus efforts to maintain colleges and universities as what Edward Morrison, executive director of the Center for Regional Economic Development (REI) at Case

continued on page 57

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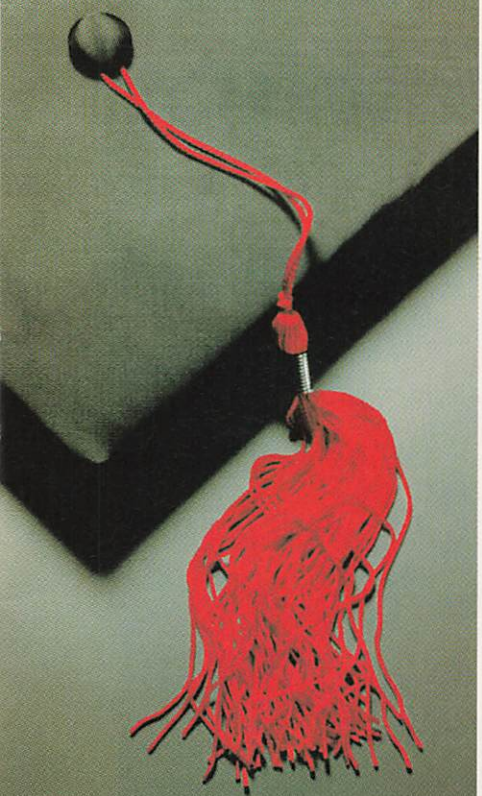

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Technology dreamers are always pondering what the next "killer app" will be. I want to propose that we have a real killer app on our campuses right now. It's certainly not what comes to mind when we are dreaming about killer apps, but this critical enterprise application is wearing us all down. And sometimes it feels as if it is killing us. It has certainly shut many of us down for periods of time. It is taking the scarce time of some of our best technologists and keeping us from implementing newer services or improvements to existing services. And it is costing us money as we upgrade our servers and add spam and virus management software to our mail environments. I'm talking about that most ubiquitous of applications: our e-mail service.

In the past year, in a meeting with our deans at UW-Madison, I came away with the impression that e-mail had become a more important means of communication than the phone. This distinguished group of campus leaders, along with the rest of us, has become very dependent on a reliable e-mail service to do their university business. And these folks expect this service to be on all of the time, as well as very fast. Those of us responsible for both the telephony service and the e-mail service know that our phone service is extraordinarily reliable. But to date, our e-mail services are not 99.99 percent reliable. And just try talking about a service with a 95 percent uptime. That certainly won't fly—it's more than 18 days of downtime. And 99 percent is hardly good enough with almost four days of downtime. Yet, between some of the attacks we have had on our systems during this past year, as well as time required for maintenance and upgrades, I imagine most of us have not seen a service that has been available without some significant degradation for 99 percent of the time.

It's the volume of mail that is making e-mail the killer for me. I report to the provost at Madison, and I periodically call him to ask if he has reviewed something that I sent to him. He almost invariably responds that he has—and that he has sent me an answer via e-mail. When I look, I find that his e-mail is one among the multitudes in my in-box. I have been managing my work life on e-mail for a long time now, but the volume of mail I receive boggles my mind. My inadequate solution is to rapidly skim the headers of incoming mail and select a few messages that I am sure I need to read, and read them. Doing this, I clearly am missing many messages that I should be attending to.

Our campus mail servers have spam management software running. I do have some spam filters set for my incoming mail: I do try to refer junk mail to the junk folder so that my smart filters get smarter. I'm not as diligent about this as I should be—because it takes time. I want to use e-mail as a tool for my own productivity, not as something that I have to keep managing, something that I find a time sink.

I did a non-scientific survey of colleagues around the country to determine what had happened with mail volume during the past year and what folks were doing to manage that volume. I received responses from 28 institutions including my own. I asked how many mail messages were received during April 2003, and how many were received this past April. I asked folks what the percent of spam was during those time periods, and whether spam filtering was being used at the server level. The schools I surveyed were small and large. A year

continued on page 58

Illustration by Peter Bennett

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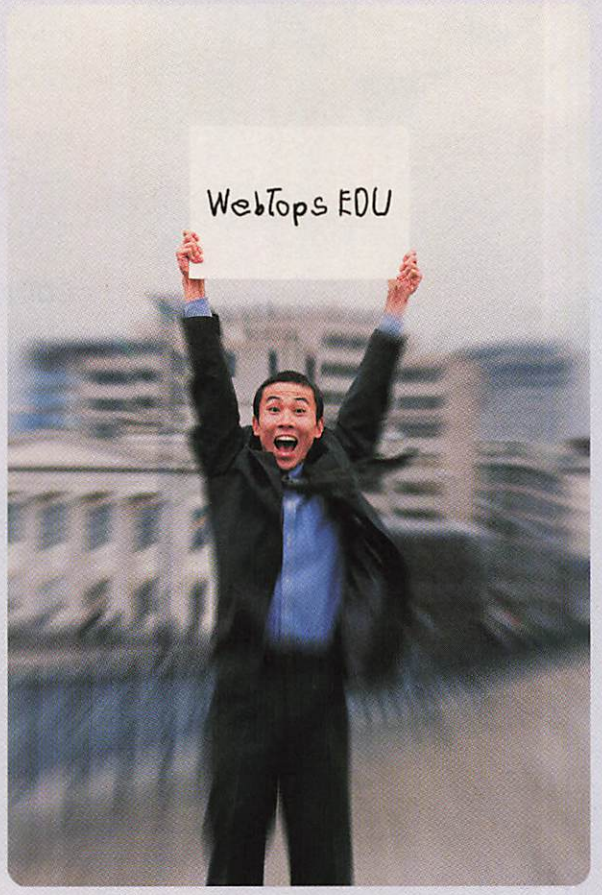

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Online Course Development: What Does It Cost?

Does it cost less to design and develop online teaching and learning today than it did a few years ago? Are the categories of cost different today from the past and from what the costs might be in the future? The costs of developing online programs are significant, yet there are few resources to help planners. Here, Judith Boettcher proposes a few guidelines for predicting the costs involved in the design and development of online instruction.

By Judith V. Boettcher, Designing for Learning and the University of Florida

Five or more years ago, projects for the design and development of online instruction included costs for basics such as faculty hardware and software, instructional programmers, and other campus infrastructure and applications that are now, hopefully, in place. In the early years, the environment and applications for an online course often had to be designed and built from scratch, line of programming code by line of programming code. In addition to these costs, there were the familiar costs of faculty professional development time and many expenses associated with content research, selection, capture, analysis, and digitization.

Much of our current infrastructure now includes learning management systems, faculty and student support personnel, and content licensing. That means the instructional costs for teaching and learning online are distributed more broadly across the campus community. This leads us to Rule of Thumb #1.

Rule of Thumb #1: A Learning Management System Reduces Costs for Design, Development, and Delivery—Use an LMS

The campus digital plant—the online system analogous to our campus physical plant—is here. With an LMS, faculty have an entire online teaching and learning classroom, campus resource, and conference center suite at their disposal. A campus infrastructure that provides a learning

management system (LMS) for their faculty and students provides not only the four virtual walls of a classroom—the course Web site—but also places for gathering, discussing, and thinking that students can use for forums, student discussion areas of all types, faculty office meeting spaces, project working space, presentations, and virtually infinite databases and libraries of content. The LMS systems available today offer flexible environments that readily and easily support the three dialogues for effective teaching and learning: faculty-to-student dialogue, peer dialogue, and student-to-resources dialogue.

It bears repeating—the first rule of thumb is to use an LMS. Whether it is a commercial, home-grown, or open source system is not as important as whether it meets most of the collective needs, philosophy, and wants of the faculty delivering degree programs. Deciding which LMS to use is usually a campus-wide decision process, as it is akin to architecting and designing a classroom building system to serve all campus and online courses for a minimum of three to five years. For a quick look at the number and size of LMSes that are available, go to www.edutools.info where more than 100 LMSes are described according to over 40 different features and functions. The recently announced open source Collaboration and Learning Environment (CLE) software being developed by the Sakai Project (http://www.sakaiproject.org/) will very likely be an additional key resource in the future.

In addition to the community-wide campus infrastructure, faculty and students now have their own personal knowledge infrastructure. This personal infrastructure consists of laptops, basic and advanced productivity software, communication (often wireless) access, and all-digital textbooks, if desired. A prime example of the personal knowledge infrastructure is the laptop university model. With the advent of wireless access, more and more campuses are looking like laptop universities. What a difference just a few years can make!

1994 - 2000 Phase 1: Launching of Online learning	2001 - 2005 Phase 2: Infrastructure and Course Model Development	2006 - 2010 Phase 3: Institutionalizing and Refining of Online Learning
■ Hardware and software ■ Support and training ■ Infrastructure development ■ Networking and access to network	■ Infrastructure development ■ Learning management systems and support ■ Networking and wireless access ■ Faculty and student personal knowledge tools	■ Infrastructure, including networking and support, is assumed and part of campus environment ■ Wireless communications access everywhere
■ Design/development of early course and tool templates	■ Instructional tool design and development ■ Development of online and distance course models	■ Licensing of courses, including instructional team and support ■ Collaborative development across institutions
■ Programmers	■ Design/development of application-specific tools and resources ■ Instructional Developers	■ Licensing and purchase of higher-level tools and development "engines," and middleware developed by programmers
■ Content digitization projects	■ Design of repositories and databases of content ■ Development of animations, simulations ■ Development of learning objects	■ Development of complex, authentic learning objects ■ Search for and licensing of learning objects ■ Subscriptions to content repositories and news feeds.

Table 1: Shifts Over Time in Primary Cost Categories for the Design/Development of Online Learning

Rule of Thumb #2: The More Hours of Instruction to be Designed and Developed, the Higher the Cost of Design and Development

Rule of Thumb #2 may seem obvious, but determining the number of hours of instruction to be designed for in a given program is not always obvious. For example, how many hours of online learning make a three-credit course? Here is a formula, based on the traditional model of a campus course: Using a formula of two hours of study outside class for every hour in class means that the usual three-credit campus course is 135 hours (45 hours of class time and 90 hours of directed study outside the class time). This formula means faculty transitioning a campus course to an online format only have to design and develop the 45 hours traditionally spent in the classroom. However, once this transition is done, many of the additional 90 hours of directed study are also redesigned over time. By the way, the number of hours—135—can be increased or decreased, based on the design of a particular program as well as the expectations of a campus culture.

The cost literature provides estimates for the number of hours of faculty effort required to design/develop an hour of instruction in media such as a lecture, a videotaped lecture, a book, or online material. A good planning number for a new faculty developing online instruction five years ago was 18 hours per hour of instruction, or 810 hours for a fully online course. Given the current campus infrastructure, personal knowledge tools, and the availability of digital content such as course cartridges, online cyber problems, and test banks, a recommended planning number today for experienced faculty is 10 hours per hour of instruction.

This is faculty time, and does not

include the time for other support personnel, such as project managers, instructional designers, or other support. However, as faculty develop expertise, as the tools get better, designing and developing online instruction becomes closer to the time required for developing face-to-face instruction. It is the transformational design and the building of technology habits that takes time now.

Rule of Thumb #2: Corollaries

- The first online course designed/developed by a faculty member takes longer than the second course.
- Adopting a textbook for a course that has extensive online content for faculty and students saves design and development time.
- Developing simulations, animations, and sophisticated learning objects are not included in the time estimates above.

It's good news that the time required to build an online course has decreased over time, but the decrease may not be as much as one hopes. The work from the Washington State University case study in the TCM/Bridge Project report (Jewett, 2002, p. 32) estimated a "learning curve" effect of only 10 percent for a second course. This means that the formula for a second course conversion would be 90 percent of the effort for a first course.

Institutions provide design and development, including learning time, for faculty in a number of ways. For an online Master's of Engineering in Professional Practice (MEPP) at the University of Wisconsin (Pferdehirt, 2004), faculty have 1.2 months to prepare an online course, followed by another 1.8 months to pilot the course with a small group of students. Another professional program in information studies (Estabrook, 1999) provides summer money or release time to develop an online course. When first-time faculty deliver an online course, it is the only course they teach that semester.

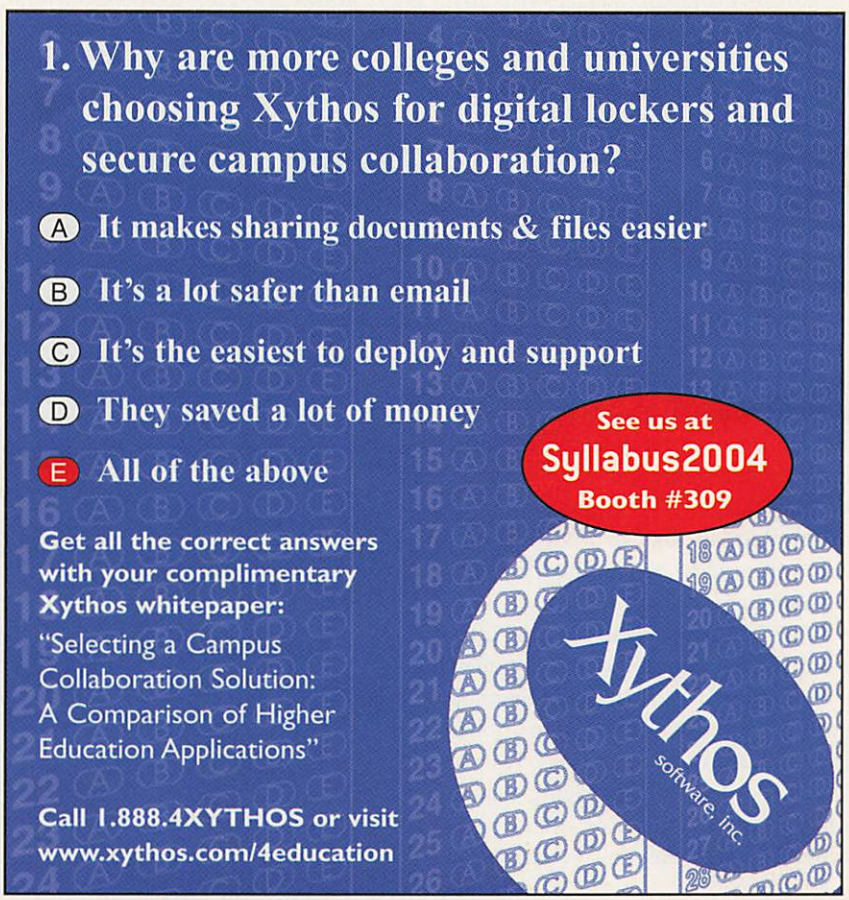
In the future, the faculty work in design and development may shift to more of an emphasis on being able to quickly identify and integrate more sophisticated and hopefully, advanced and effective learning materials. In related developments, gaming vendors are searching for efficiencies in developing games for "hours of play" by licensing sophisticated graphic engines. As noted in a recent article, "A typical game these days costs millions of dollars to produce, much of it going to huge teams of programmers" (Gomes, 2004). Once evolved by the gaming vendors, we may see these middleware engines available for our instructional content materials.

Rule of Thumb #2: Irony

I would be remiss not to note the irony that can result from using the metric of the hour of instruction for costing instruction. Well-structured materials, including simulations, animations, and micro-worlds, that might assist students in learning core concepts and in developing authentic skills can require hundreds of hours of design and development time. On the plus side, student time in learning decreases, and this is particularly useful for highly paid professional lifelong learners.

Rule of Thumb #3: Design and Development of Online Degree Programs Can Cost Up to $25,000 Per Credit Hour

If program planners use a working estimate of $10,000 per credit hour for a master's degree program, then a 30-credit master's degree program can require an investment of $300,000. The available examples in the literature often provide examples of investments ranging higher, in the neighborhood of $15,000 to $20,000 per credit hour. Institutions have been very creative in finding ways to reduce these up-front investment costs. Some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1994 - 2000 Phase 1: Launching of Online learning	2001 – 2005 Phase 2: Infrastructure and Course Model Development	2006 – 2010 Phase 3: Institutionalizing and Refining of Online Learning
■ Securing sponsorship and investment funds		■ Securing sponsorship and investment funds ■ Traditional planning and budgeting within college and organizations
■ Piloting and experimentation	■ Piloting and experimentation ■ Online learning as cost center primarily	■ Program analysis and market research ■ Online learning as cost center and also fully integrated; ■ Online learning as a schedule option
■ Project management and administration ■ Instructional Design		
■ Faculty development, time, and expertise	■ Faculty development, time and expertise ■ Gradual expansion of instructional team	■ Faculty development, time and expertise ■ Recruiting, training and managing of instructional team

Table 2: Cost Categories for the Design/Development of Online Learning That Have Remained More Constant

strategies that appear to be successful are collaborating with other institutions and finding corporate sponsors for whom programs are specifically designed and delivered.

Rule of Thumb #4: Instructional Costs Shift with Technology Developments and Models of Instruction

Table 1 attempts to capture some of the shifts in primary cost categories over time. The most useful part of the chart may be in anticipating the next shift in cost categories. Where are the new costs likely to be? In particular, we ought to tentatively plan for increased costs in the area of licensing sophisticated and timely content resources. Also, the work of the faculty is becoming even more unbundled, so that an instructional team will need to be recruited, trained, and managed.

Table 2 shows some of the cost categories for the design and development of online learning that have remained more constant over these transitional times. Many of these categories are costs associated with managing change across many segments of the campus faculty and staff. Another primary area of relative constancy is that of content. The development of content is expensive and will continue to be so in the future, even as we develop and have more access to sophisticated, authentic, complex instructional objects and as access to current news and well-structured databases increases in importance to instruction.

A Challenge to Study Costs

While it is still difficult to identify accessible literature on the costing of instruction, resources to assist in the costing and budgeting of instruction, whether on campus or online, are beginning to increase. The most comprehensive resource at this time that is freely available is the *Technology Costing Methodology Handbook (Jones, 2001)*. We have many challenges going forward in this area as the standards and metrics for costing instruction remain in flux and difficult to define—probably because the instructional mission is so integrated with an institution's multiple missions. However, it is a challenge worth taking on, and I encourage you to contribute to these efforts.

Judith V. Boettcher (jboettc@attglobal.net) *is an independent consultant specializing in distance learning and the applications of new media.*

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Syllabus 2004

11TH ANNUAL CONFERENCE AND EXHIBITION

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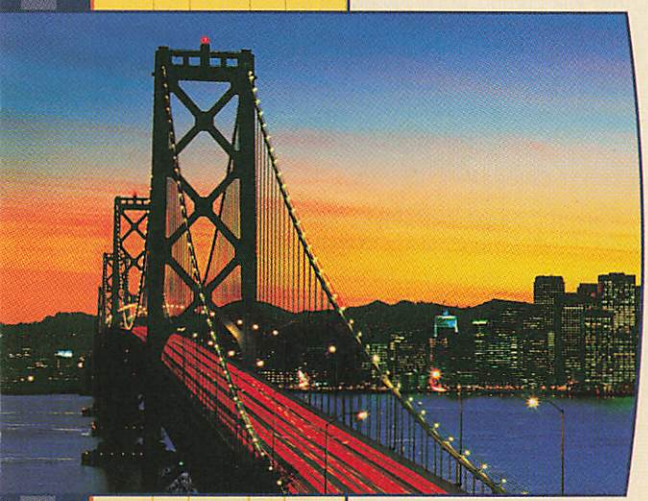

A BRIDGE TO THE FUTURE:

TECHNOLOGIES TO CONNECT THE CAMPUS

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- A day at UC Berkeley exploring innovative learning technologies, emerging modes of teaching, and collaborative computing environments
- Expert panels and thought leaders with diverse viewpoints on IT's hot topics
- A collegial setting for exchanging information and networking with peers

TRACKS

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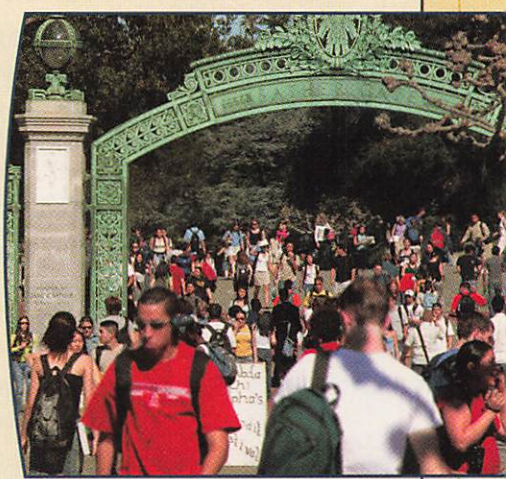

Sather Gate, UC Berkeley
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KEYNOTES

MONDAY, JULY 19

DIGITAL LEARNING CULTURES IN THE INFORMATION LANDSCAPE

8:30 – 9:30AM

Clifford A. Lynch, Ph.D. — Executive Director, Coalition for Networked Information & Adjunct Professor, University of California, Berkeley

A number of distinct cultures have evolved concerned with the various aspects of IT-enabled learning: "Learning objects" and the repositories that aggregate them are well established; "Learning management systems" (sometimes called "course management systems" or "virtual learning environments") operate on very different levels of abstraction; the entire evolving infrastructure of digital collections, digital libraries and institutional and disciplinary repositories are now struggling to formulate appropriate linkages with the world of digitally-enabled learning; and, finally, the additional perspectives of scholarly communication and records management are demanding recognition. Lynch will examine these sometimes-competing and conflicting points of view and sketch the developing linkages and relationships among them. He will discuss both the prospects for an effective synthesis of these different perspectives and some of the questions that we need to answer in pursuit of such a synthesis.

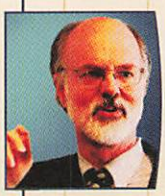
UC'S TURBULENT TIMES AND THE ROLE OF IT

11:05 – 11:45 AM

Kristine Hafner, Ph.D. — Associate Vice President, Information Resources and Communication, University of California, Office of the President

Dr. Kristine Hafner will discuss Information Technology's role in the University of California's roller coaster ride through budget and growth ups and downs since the year 2000. She will also discuss the New Business Architecture report, "UC 2010: A New Business Architecture for the University of California", and how it has guided campus and system-wide IT-related initiatives. Hafner will conclude by reviewing some of the strategic IT-related issues that will likely confront the University of California in the next several years.

TUESDAY, JULY 20



COGNITIVELY INFORMED ONLINE COURSE DESIGN

8:30 – 9:45AM

Joel Smith, Ph.D. — Vice Provost and Chief Information Officer for Computing Services, Carnegie Mellon University

Many challenges remain in the delivery of effective technology-enhanced learning in higher education. To realize the potential of web-supported learning environments, it will be necessary to make dramatic changes in course development, informed by relevant findings of contemporary cognitive science and learning theory. Digital learning environments can be instrumented to provide multiple, rich feedback loops to students, instructors, and designers. These efforts should be supported and sustained through promotion of cohesive communities of use that represent a more powerful "scholarship of teaching" with online tools. Smith will present these principles in light of his extensive research and work with Carnegie Mellon University's Open Learning Initiative (OLI), a new approach to making web-based courses openly available to any individual learner.

WEDNESDAY, JULY 21

CAN THE INTERNET SURVIVE?

8:30 – 9:45AM

Jeffrey Schiller — Network Manager, MIT

The Internet was originally designed to permit people to use computers that were far away from them. However it quickly evolved into a powerful means of communication between people. Today, a true "Peer to Peer" network has developed, one on which anyone can communicate with anyone else and everyone may publish or consume information. But, that network is under attack. Viruses, worms and the scourge of spam have compromised its nature and put its very existence at risk. The easiest solutions for dealing with these threats could in the end destroy the core values and essence of the network. Schiller will consider better, though more difficult, strategies for securing the continuing usefulness and effectiveness of the Internet.

THURSDAY, JULY 22

WANDERING THE TECHNOLOGY UNIVERSE

8:30 – 9:45AM

Annie Stunden — Chief Information Officer and Director, Division of Information Technology, University of Wisconsin, Madison

Take a trip with Annie Stunden from the core of the technology infrastructure to some of the places on the outer edges of our technology universe as we know it today and can envision it in the next year or two. Stunden will talk about building the base that we wander from and where we might meander as we support our students, faculty and staff. She will also talk about some of the perils we encounter and some of the wonders we find as we explore real possibilities and make them our own.

Panel Sessions

Is Open Source in Your CMS's Future? Monday, July 19, 3:30 – 4:45pm

Moderator: Victor Edmonds, Ph.D. — Director, Educational Technology Services, University of California, Berkeley

As course management systems have matured, they've encompassed wider functionality and integrated with numerous other campus systems. As with most large, complex systems, the unbundling of service and software components may produce greater opportunities for efficiencies and customization. Open source efforts in general, and specifically SAKAI, may be the wave of the future for CMS.

Panelists:

Kathy Christoph — Assistant Vice Chancellor for Academic Affairs, University of Wisconsin, Madison
Charles Kerns — Educational Technology Manager, SAKAI Project, Stanford University
Phillip D. Long, Ph.D. — Senior Strategist for the Academic Computing Practice, MIT
Brad Wheeler, Ph.D. — Associate Professor and BAT Faculty Fellow of Information Technology & Associate Dean for Teaching and Learning Technology, Indiana University
Mara Hancock — Associate Director, Learning Systems, Educational Technology Systems, University of California, Berkeley

Pushing Technology into the Background— Services for Useful Collaborations Tuesday, July 20, 4:30 – 5:30pm

Moderator: William H. Riffee, Ph.D. — Associate Provost for Distance, Continuing and Executive Education, University of Florida

The "gee whiz" factor is gone from the transmission and display of data bits, as well it should be. Today's students can rightfully expect technology to serve their needs effectively and unobtrusively. What are the collaborative tools and services your institution should offer, and how can these applications now operate ubiquitously in the background—behind the walls and in the air? This panel will discuss their views on evolving technologies and services.

Panelists:

Lois Brooks — Director, Academic Computing, Stanford University
William Griswold, Ph.D. — Professor, Department of Computer Science & Engineering, University of California, San Diego
Lonnie Harvel — Director, Computer Enhanced Educational Services, Georgia Institute of Technology

Your Campus and the TEACH Act: Scenarios and Services Wednesday, July 21, 5:00 – 6:00pm

Moderator: Judith Boettcher, Ph.D. — Consultant, Designing for Learning & University of Florida

Come to this session with your questions and suggestions about offering courses online, in view of the TEACH ACT. This panel of experts provides program scenarios and guidelines to help in interpreting the provisions of the Act, including the criterion for e-reserves and also how to cultivate a campus environment that supports faculty and staff knowledge about this important legislation.

Panelists:

Laura Gasaway, J.D. — Director, Law Library & Professor of Law, University of North Carolina, Chapel Hill
John Harwood, Ph.D. — Senior Director, Center for Education Technology Services, Penn State University

Evolution and Innovation in User Support Thursday, July 22, 11:15am – 12:30pm

Moderator: Howard Strauss — Manager, Technology Outreach, Princeton University

Help! There is a growing menagerie of wireless intelligent devices including laptops, PDAs, Blackberry devices, and PDA cell phones on which users expect Web page delivery, e-mail, and the full suite of university applications. Traditional four-year resident students have become the exception rather than the rule. Technological and social changes are radically transforming user support needs. How should IT organizations provide support in this new environment?

Panelists:

F. Meena Lakhavane — Director of User and Educational Services, Carnegie Mellon University
Ricky Telg, Ph.D. — Associate Professor, Agricultural Education and Communication, University of Florida
Mark Veljkov, Ph.D. — Executive Director of Learning, City University OnLine

A Day at UC Berkeley

Syllabus2004 features a day of learning and exploration the University of California, Berkeley, on Monday, July 19.

The Berkeley campus is renowned for its libraries, laboratories, research, and publications, as well as the distinction of its faculty and students.

Included in your registration, this special day on campus affords you the opportunity to see and experience the latest education technology in action, as well as hear from some of the leading scholars on technology in higher education.

Paul Gray, Ph.D., Executive Vice Chancellor and Provost of UC Berkeley will give an overview of Berkeley and some of its programs, followed by Kristine Hafner, Ph.D., Associate Vice President, Information Resources and Communication, University of California, Office of the President, with a special on-campus keynote.

That afternoon you will have the opportunity to participate in a variety of sessions led by UC Berkeley faculty or take a self-guided tour of the campus. For complete details for the entire conference, go to www.syllabus.com/summer2004.

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The Other Kids on the Block

Commercial Providers Grow Up in the eLearning Space

In a market that has been dominated by two big players, WebCT and Blackboard, how will other commercial vendors gain market share and thrive? *Syllabus* interviewed key executives at two companies—Unicon and Desire 2 Learn—about how they plan to continue to be successful in this difficult and evolving market.

The market for learning management systems in higher education is changing. Open source environments—Sakai, OpenCMS, Plone, Moodel, Segue, and soon Harmoni—are not only alternatives to "black box" systems; they are points around which higher education may organize to influence market directions.

One notable project, the OpenKnowledgeInitiative (OKI) was funded in 2000 by the Mellon Foundation to provide a framework and proof of concept for an open source learning management system. More recently, Sakai, also funded by Mellon, has gone beyond that by promising a full-scale production open source learning management system by Summer 2005. Vendors wishing to compete in this marketplace must recognize the unique collaborative nature of higher education and the impact cooperative development efforts may have on their market strategies.

Unicon's Strategy: Up with uPortal

Unicon CTO Kevin Gary comments that his company is taking a different approach by leading with a portal solution. Unicon's Academus product suite provides a portal based on the open source uPortal software, with a learning management system built as a channel inside the portal and offered to customers as a value add-on charged at 20 percent of the portal price.

"It's a risky proposition in some sense to build your entire product suite inside a portal and say that you can't pick it up and run it as a normal Web application," says Gary, referring to his company's decision of two years ago. "But at the time uPortal was just on the rise, so it was a very interesting combination of factors for us to get involved with JA-SIG, to merge with Interactive Business Solutions (IBS), to provide a dashboard user interface, and see it all come together…we really think this has put us in a very unique position in that uPortal's trajectory is still rising in this space."

Perhaps the most intriguing part of Unicon's model, with Academus built natively within uPortal, is that Unicon is one of the four Sakai commercial affiliates. And since Sakai is built on uPortal, Unicon is certainly well-positioned to participate in and benefit from common development efforts. "We're excited to see ourselves in this space," says Gary, "because I think the Sakai folks have realized that they need to take a collection of

functionality—a collection of systems—and put that on top of a common platform and also a common user interface in terms of a portal." Running with uPortal, Unicon seems to be carving out a niche role for the future.

As for the present state of the market, Gary observes that Unicon is picking up business from WebCT and Blackboard institutional users that are unable to buy the additional licenses they need and can't afford to move up into a higher tier with their current vendor...as well as from faculty who aren't happy with their LMS. "Frankly, we've had some success just from the dissatisfied customer base of WebCT and Blackboard—some from a price perspective and some from a functionality perspective," says Gary. "We've gone into some institutions that are simply tired of the price gouging that's going on with WebCT and Blackboard. There's a certain part of the market that feels a little held captive."

In terms of future development, Unicon is setting its sights on further integration and interoperability. Their plan is to migrate Academus up to the portlet standards that uPortal will soon provide to enable cross-portal integration. They are looking at other portal solutions that they could potentially integrate with—in order to open up further market potential. They've also selected features and functions to work on, based on market feedback. Single sign-on adapters is the highest on the list, along with data integration, XML content delivery, and assessment tools.

A notable example of their data integration effort will be Unicon's 1.3 release of Academus, currently in beta, that is going to have an integration piece with Datatel, to input all the SIS information that Datatel stores in its Colleague product. Unicon can import the administrative data into Academus, as well as export certain data—like grades—to provide seamless integration with the SIS.

Unicon is an academically informed company, with many of the officers and staff coming from positions within Arizona State University, including founders John Blakley and Chris Franz. "We really enjoy being involved with higher education," says Kevin Gary. "I think you have to have that passion or else you might not be in this market. In any market you might say that your customers have unique needs. But in higher education, you really mean it."

"In any market you might say that your customers have unique needs. But in higher education, you really mean it."

Desire 2 Learn: "Just Listen"

John Baker, Desire 2 Learn's CEO, says that his company's most important strategy is to listen to customers. "For us to succeed, the biggest thing that we have to do as an organization is really *just listen*. We strive to work with our clients and focus on having the resources to respond to them." Baker notes that the 7.4 release had more than 200 new feature enhancements, of which about 90 percent were driven by client requests.

Desire 2 Learn's goal is to give the clients full control over their systems, defining the rules, structure, organizational units, look-and-feel, and branding. "As soon as we made the decision not to try to solve every problem with a single solution but instead create technology that can adapt, it's made our life easier and the clients are much happier," says Baker, who views this as a much different approach from some of the bigger competitors.

To avoid code modifications that can disappear during version upgrades, the company has tried to use forms and databases, allowing the customer to modify settings. Institutions can thereby define different fields and role structures to suit their particular needs. "We try to make that process very, very easy and eliminate as much of the administration as we can so that the instructional designers, faculty, and support staff can spend more time on the students," says Baker.

Differentiation is increasingly important as institutions vie for enrollments. "Students are going to look to see what separates one institution from another," Baker asserts. "Institutions are going to try to differentiate themselves. With Desire 2 Learn, you won't see the same sort of cookie-cutter approach if you look across different institutions." The same is true even within institutions—different departments or programs within a single institution can generate their own roles, fields, and so forth, as needed.

Desire 2 Learn has enjoyed tremendous growth, from the time its first platform debuted in 2000 with about 1,000 local users to estimates of about 1.8 million users in North America today. A well-publicized and significant jump along the way was the win of a rigorous vendor selection process at the University of Wisconsin system in Spring 2003, to bring up a single statewide platform with about 160,000 students. With that contract, the company was able to demonstrate that their technology could scale. Other statewide contracts have been added since.

Instead of market share, development and service are the priorities for Desire 2 Learn. "As we went through the rapid growth, instead of doing more marketing, we put all of the extra resources we had back into the organization for more R & D, service, and support," explains Baker. The company spends 60 to 70 percent of its budget on R & D.

"But most importantly, we're trying to establish ourselves as the clear leader when it comes to the best possible, technology, service, and support for our clients," says Baker. "We entered this space to help our clients improve the quality of the education that they're offering, while making sure that the time they are spending isn't clicking buttons—it's time for teaching and learning."

Dell University

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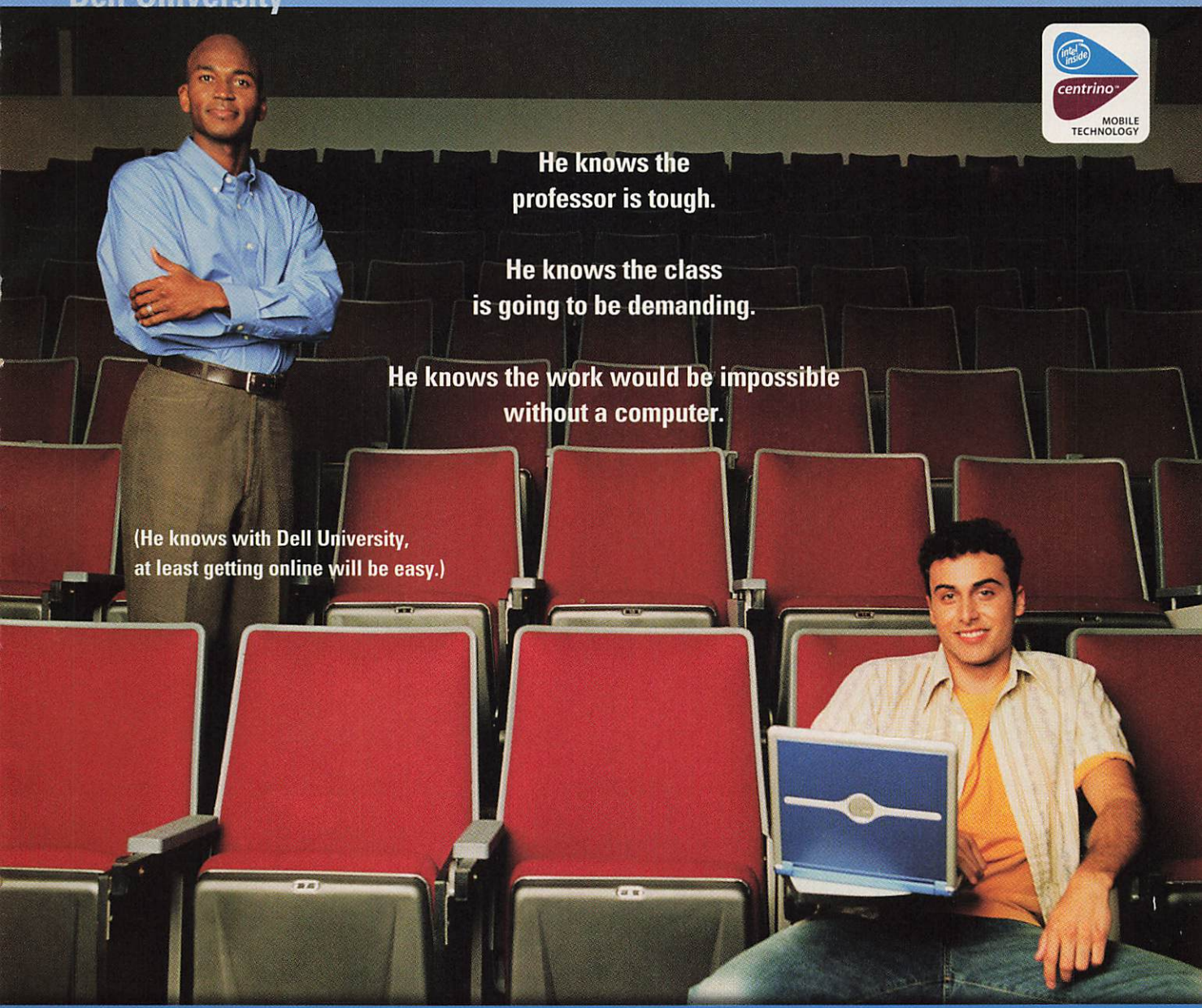
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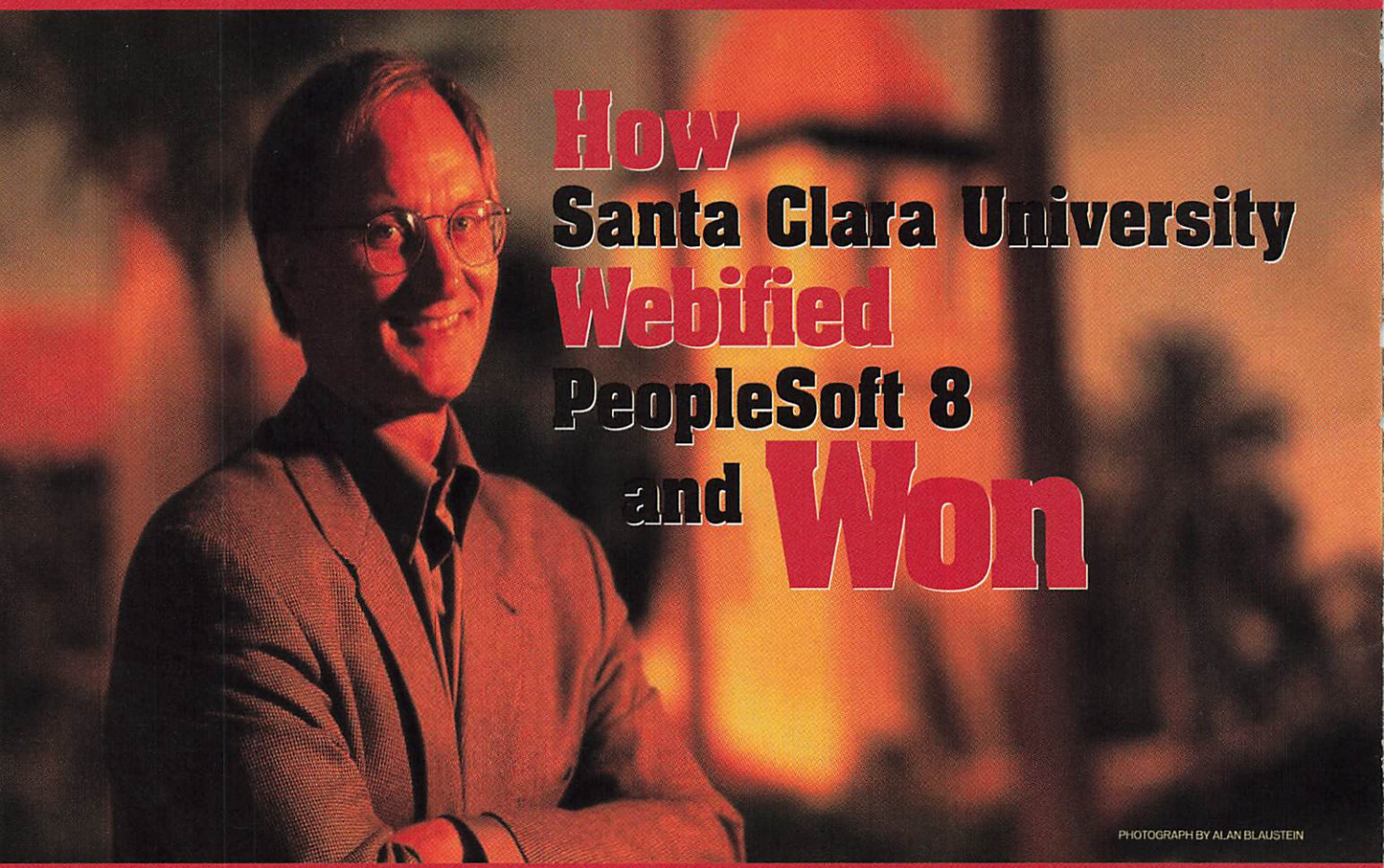


How Santa Clara University Webified PeopleSoft 8 and Won

PHOTOGRAPH BY ALAN BLAUSTEIN

CIO Ron Danielson's Triple Play of Bandwidth Savings, Increased Server Capacity and Extended Life Cycle.

THE IDEA was to provide more widespread access to business-critical enterprise applications without increasing the administrative burden on the IT department. Before that goal would be realized, however, Santa Clara University (SCU) got a lesson in what can go wrong with Web-based applications and, more importantly, how to remedy the problems.

In July of 2002, SCU made the move to PeopleSoft 8, the Web-enabled version of the popular application suite. The school uses PeopleSoft to support human resources, financial and student administration applications, including admissions, financial aid and course registration programs, says Ron Danielson, chief information officer for SCU, an 8,000-student university in Santa Clara, Calif.

"As much as we possibly can, it's our intention to push access to administrative information out to students, faculty and staff," Danielson says. With the previous version of PeopleSoft, that was a challenge because it required client software on each user's desktop. "With the Web front end, anybody with a browser can come in and get access."

Access they did, so much so that the university's application servers were overloaded and performance was much slower than with the previous version. "We were one of the first half-dozen universities in the country to upgrade to PeopleSoft's new Web-based product, and we thought we'd spec'd out our network and equipment adequately to meet our performance needs," he says. "But we weren't even close."

SCU'S REDLINE BENEFITS AT A GLANCE:

- **Bandwidth reduction: E|X 3250 reduces bandwidth requirements by up to 10M bit/sec, saving SCU at least $48,000 per year.**
- **Increases server capacity: Offloads connection management, I/O and SSL processing, essentially cutting server loads in half.**
- **Reduces number of network components: Reduces the amount of data traffic, enabling network components such as firewalls to handle more load.**

IN SEARCH OF A FIX

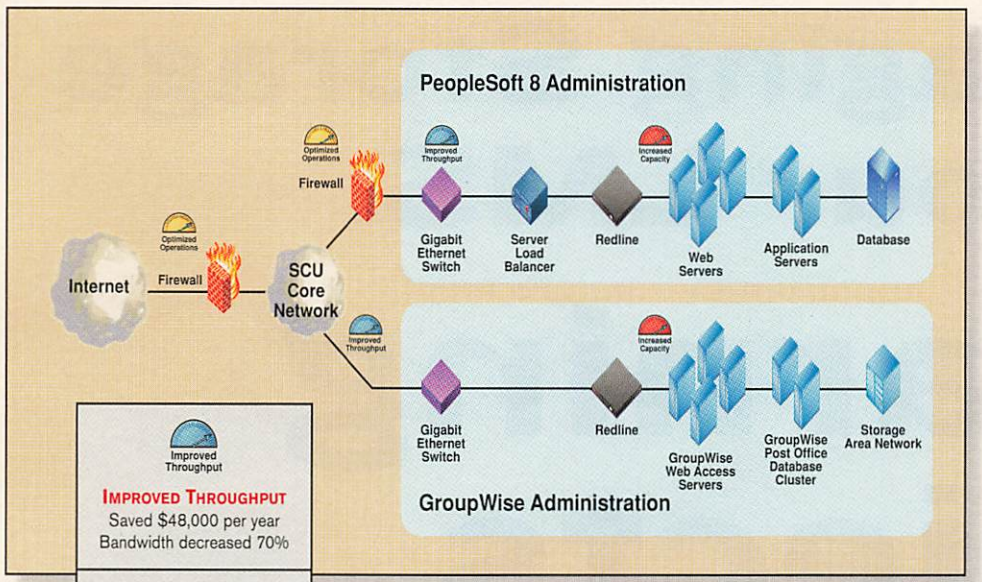
Initially, Danielson and his staff tried throwing more hardware and software at the problem. To an initial configuration of one Web server and one application server, they added three more Web servers and one new application server. They also brought in performance management and software tuning tools, and changed some PeopleSoft parameters related to processing input from users.

"This brought performance to an 'acceptable' level," Danielson says. "But now we had six servers instead of two, and we were still spending a lot more time on the problem than we would have liked."

In the fall of 2002, the university learned about Redline Networks of Campbell, Calif. Redline makes a family of appliances designed to improve Web-based application performance by offloading from the server I/O processing and connection management chores, while compressing content to conserve bandwidth. The appliances also handle Secure Sockets Layer (SSL) processing, thus serving to improve security.

LESS BANDWIDTH, MORE PERFORMANCE

In November, SCU installed one of Redline's E|X 3250 appliances and saw an immediate,



dramatic improvement. Bandwidth usage associated with the PeopleSoft applications plummeted by 70%, thanks to the compression features inherent in the E|X 3250. At the same time, because the E|X 3250 handled connection management chores and I/O processing, server capacity effectively doubled.

The magnitude of server capacity and performance improvements hit home when one of the university's servers went down for more than a week. "We didn't even notice a change in performance," Danielson says. "That tells us how much headroom the Redline box has given us with our PeopleSoft applications."

Like the rest of Redline's enterprise application processors, the E|X 3250 sits in front of servers and receives requests from hundreds or thousands of client browsers. It processes the thousands of relatively slow requests as they come in from users and shuttles them to the appropriate servers at high speed over just a few dozen persistent TCP connections.

"As far as the Web servers are concerned, they have a single connection, which is to the Redline box," Danielson says. The servers no longer have to perform complex scheduling of requests arriving randomly over a large number of connections. Instead, they service each response as it arrives and send information back to the enterprise application processor, which delivers pages to the client browser at whatever speed the browser can efficiently handle.

The E|X 3250 worked so well for SCU's PeopleSoft implementation that the university soon installed an additional unit to improve the performance of Novell GroupWise servers that provide Web-based e-mail access. Here the E|X 3250 sits in front of four servers, performing load balancing, connection management and compression. For its GroupWise application, the university also takes advantage of the E|X 3250's SSL offload capability, which obviates the need for the servers to maintain large amounts of user data, including client certificate information. It also ensures that end users have no direct access to the application servers and the often-sensitive information they contain.

Results from the GroupWise implementation have been similar to those for PeopleSoft: bandwidth consumption on the university's WAN links has been cut in half and response time has improved.

SAVINGS, SAVINGS, SAVINGS

The bottom line, Danielson says, is that the Redline appliances enable SCU to realize savings in three areas: bandwidth reduction, increased server capacity and extended life cycle of other network components.

Bandwidth savings come from the compression features of the appliance, which are browser-aware to adaptively compress content for each requesting user and never require specialized client software. The features save 6M to 10M bit/sec of bandwidth, which Danielson says would cost the university an additional $4,000 to $5,000 per month.

In terms of server capacity, Danielson figures he could remove two of the four servers supporting his PeopleSoft implementation without suffering a performance hit, although he has opted to leave the installation as-is to allow for anticipated growth in the number of applications and users. Similarly, on the e-mail side, "We probably won't have to grow that server farm dramatically to handle additional load," he says.

Just as the Redline appliances enable him to get more life out of his servers, they do the same for network components such as firewalls. "With the Redline box reducing bandwidth usage, there's less for the firewalls to examine," so a single firewall can effectively handle more load.

In coming months, SCU will be adding to its Redline implementation another server group that supports university financial applications.

To sum up, Danielson says, "This box delivers on all its claims."

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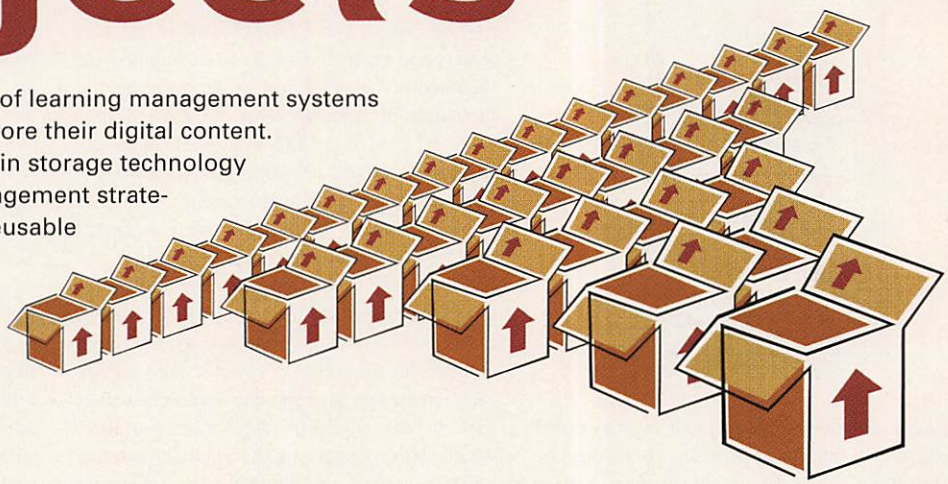
REDLINE NETWORKS

Managing Storage on Your LMS: Learning Objects

As the acceptance and utility of learning management systems grows, so does the need to store their digital content. Waiting for the next advance in storage technology is not enough—storage management strategies that involve the use of reusable content objects can help.



By Krishna P.C. Madhavan, Purdue University

Recently, a faculty member here at Purdue University decided to surprise some of the IT support staff by uploading several gigabytes worth of movie clips to our learning management system (LMS). Thanks to the reliable system monitoring tools that are in place, a disk space alert was immediately sent out to all system administrators. Disk space was quickly added to the relevant servers resulting in a temporary fix to a potential storage problem.

As a stream of e-mails related to the above incident flew back and forth among members of the IT team, I asked myself, "We have so many media streaming servers... *Why* did this faculty member decide to throw a ton of media content inside our learning management system?" One might also ask how instructional designers might help educate faculty members on the appropriate use of space on the university's learning management system. What type of sound content design strategies can provide a foundation for effective storage management with respect to learning management systems?

Storage problems related to learning management systems are real, and if not addressed immediately, are an imminent resource bottleneck for colleges and universities. According to Casey Green, founding director of The Campus Computing Project (2003), "... a third (33.6 percent) of all college courses now use course management tools, up from 26.5 percent in 2002, 20.6 percent in 2001, and almost double the level in 2000 (14.7 percent)." He elaborates further that the course management system (CMS) is now "a core component of the institutional instructional infrastructure." Given the rapid increase in the adoption of learning management systems at universities and the central role they play in content delivery, storage alerts will only become more widespread, many times approaching crisis levels.

More Than a Hardware Problem

Disk space is a relatively cheap commodity today. While it is true that storage technology continues to evolve and improve, simply adding increasing amounts of storage is not a long-term, scalable solution for very large systems. If we are beginning to think that faculty members who upload big media files into the LMS are the source of this problem, we have not even scratched the tip of the iceberg. It is only a matter of time before students figure out that the same system that allows them to save drafts of their assignments is yet another storage space for all the wonderful MP3s that they downloaded for free.

I can already hear many people saying—"just impose space quotas." The bad news is that as of today, even leading course management vendors like WebCT do not provide the innate ability to impose quotas on disk usage. And a critical argument against imposing space quotas that holds a lot of intuitive appeal is that if we expect faculty members to use learning management systems to deliver cutting-edge materials to their students, we cannot restrict them from using digital media, which are by their very nature bulky. Also, imposing space quotas has the potential of restricting the quantity of content that faculty can use for their courses. IT staff, who are clearly not content area experts, cannot dictate to faculty members what constitutes the "appropriate amount" of content utilized in a course.

The underlying fact is that no matter how much storage space is added, no matter how efficient the storage area networks (SANs) are, or how well planned the data backup strategy is, demands on storage will only continue to push IT planners into a corset small enough to suffocate the system. At most higher education institutions, there is an evolving understanding that the issue of storage for learning management systems cannot be solved by treating it as a hardware problem alone. Content design and delivery strategies have to be an intrinsic part of this solution. Instructional designers need to consciously adopt a digital content creation and deployment strategy that aggressively promotes content reuse. The ability of IT planners to respond to storage needs for learning management systems will hinge on the success of a strategy that is based on object reuse—keeping in mind that storage strategies derived from ill-conceived instructional design principles will only be detrimental to the instructional mission of an educational institution.

The Role of Reusable Content

It is beyond the scope of this article to detail, in depth, how learning objects can be designed such that they are reusable. However, the concept of "reusability" is central in defining a storage strategy. Systems that are SCORM-compliant by very definition provide the capability to reuse digital content. Reusability of content is achieved by assembling a variety of digital assets into "learning objects" (LOs) that provide the appropriate level of granularity. Clearly, the capability of learning objects to morph themselves to suit the context of teaching and learning holds a lot of potential for instructional designers.

The significant advantage of adopting LOs is highlighted in the following statement by Acker, Pearl, and Rissing (2003). They state that "The context for learning objects is their juxtaposition with other learning objects. They may well be used within a discipline, but their generative power is in novel combinations rather than disciplinary lineage." This means that faculty members not only gain access to content from experts within their own discipline, but also from experts across various disciplines. In addition to improving collaboration, the continued sharing of learning objects reduces the need for content duplication. This is good news for storage management. Given sufficient time, institutions that promote the use and sharing of learning objects will see a proportionally reduced investment in storage technology. Initially, these savings in terms of space and resources may not appear to be much, but over a prolonged period of time, the savings will reach significant levels.

SCORM and IMS Specifications

In a discussion of reusable learning objects and instructional design standards, it is helpful to define the fundamental differences between two terms, namely, IMS specifications and SCORM.

IMS specifications are developed and promoted by the IMS Global Learning Consortium. The specifications as released by IMS can be viewed as being in their raw form. (http://www.imsglobal.org)

Shareable Content Object Reference Model (SCORM), developed under the Advanced Distributed Learning (ADL) initiative, is an actual implementation of the IMS specifications combined with other standards and can be used as a framework for interoperability. (http://www.adlnet.org)

Most enterprise learning management systems today are compliant with SCORM. For example, starting with version 2.1, WebCT Vista allows users to import SCORM modules directly into their courses. From a storage strategy perspective, this is a very important capability that should be exploited by instructional designers.

For an excellent introduction to SCORM aimed at instructional designers, see:

Spigarelli, B. (April, 2004). *Introduction to SCORM for instructional designers.* Retrieved on May 10, 2004, from http://www.adlnet.org/index.cfm?fuseaction=developer&pageview=viewarticle&ID=4&pcatid=15

Global Specifications and a Learning Grid

As the design and deployment of learning objects are grounded in global eLearning specifications, many institutions can easily collaborate on content co-authoring, sharing, and storage. At Purdue, for example, the idea of a "learning grid" is starting to take shape. This notion, which is fairly new to the teaching and learning space, has its roots in research computing. One of the fundamental ideas behind the "grid" is that several organizations/entities pool their resources to reduce the overall computing costs for each of the individual organizations, while simultaneously maximizing computing cycles available to all. The learning grid has at its heart the same collaborative and sharing strategies that have enabled significant innovation and progress in scientific research. While the grids that are currently used in the research computing space have gone far beyond just storage and content-sharing considerations, it is important for instructional designers at college and university campuses to take a page out of the research computing book.

Learning objects provide the perfect foundation from which teaching and learning technology groups start moving towards a learning grid. The beginnings of such collaborative strategies in conjunction with learning management systems can already be seen in the fruition of system-wide storage strategies. The Purdue University system, for example, is comprised of four different campuses. However, the strategy to accommodate the storage needs for all of Purdue's campuses for their enterprise LMS is composed of a single integrated approach. This integrated storage strategy facilitates the movement of content among faculty members at various campuses seamlessly while simultaneously cutting down on storage-related spending. With the evolution of such integrated storage strategies, learning management systems can also begin to serve as institutional repositories of learning objects.

Tools to Support SCORM-Compliant Content

Institutions are beginning to invest in tools that promote the use of SCORM-compliant learning objects. In response, many software vendors have recently indicated a shift in tool design by implementing the ability to output SCORM-compliant content. Notable examples are:

Macromedia Breeze provides users with the ability to convert Powerpoint into full-fledged learning objects with ease. (http://www.macromedia.com/software/breeze/)

Trivantis Lectora Publisher is an authoring environment for creating and delivering custom interactive multimedia content, and can help authors create SCORM-compliant learning objects without programming knowledge. (http://www.trivantis.com/product_info_overview.html)

Tools for Authors and Developers

One of the positive side effects of an integrated storage strategy is that avenues for sharing digital content creation tools, consultation methodologies, and also support strategies open up for content developers. The result of such collaboration can also be seen in the type of licensing paradigms that Purdue has started to use for purchasing off-the-shelf digital content creation tools. Whereas previously each of the regional campuses licensed products individually, there is a new awareness that consolidating licensing for digital content creation tools relieves valuable IT dollars for other mission-critical purposes. The benefit to faculty members lies in the ability to share digital content in predictable, and more importantly, institutionally supported formats with colleagues in various areas across the institution. Furthermore, it is important to point out that content sharing eventually leads to reduced class preparation times for faculty.

With the proliferation of tools for producing SCORM-compliant learning objects, instructional designers and faculty members will start to become more comfortable with the notion of creating reusable learning objects as opposed to simple PowerPoint presentations. At Purdue University, one of the

continued on page 58

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Online Course Caps: A Survey

As online courses continue to permeate the curricula of many higher education institutions, administrators often raise the issue of a maximum number of students in a course—the "course cap"—as a factor that directly contributes to profitability and sustainability of online programs. Increasing traditionally low online course caps, one could argue, can help offset the costs associated with providing technical infrastructure and faculty and student support. But faculty fear that high course caps could have an adverse effect on their workloads and consequently on student learning outcomes.

By Boris Vilic, Duquesne University

At a response rate of 33 percent, 101 institutions responded to the survey. The respondents represented institutions ranging in size from about 1,000 full-time students to more than 100,000. Most of the responses (65 percent) represented public institutions (with the remaining 35 percent representing private institutions). Respondents included an array of institutional types: from community colleges and small private colleges to large state systems and very large for-profit universities.

In addition to finding the average course cap, the survey also attempted to answer related questions:

- Are there differences between public and private institutions when it comes to setting online course caps?
- Do course delivery methods influence course caps (e.g., do courses delivered via video streaming accommodate more students per class than those courses that use asynchronous discussion as the primary teaching tool)?
- Is there a difference in online course caps for programs taught primarily by full-time faculty and those taught primarily by adjunct faculty?
- Are there any differences between experienced and inexperienced providers of online courses?
- Are there differences between undergraduate and graduate courses?

Characterizing the "Average"

The survey found that the average course cap is 30 students at the undergraduate level and 28 at the graduate level (with the range between 10 and 150 students at both levels). The value that appeared with the greatest frequency (i.e., the mode) was 25 students. Public institutions tend to have notably higher course caps than do private institutions. Thus, public institutions have average course caps of 34 at the undergraduate level and 32 at the graduate level. Private institutions, however, average significantly lower course caps at 22 and 21 respectively. Programs utilizing mostly full-time faculty also tend to have higher course caps (by as many 10 students) than those utilizing mostly adjunct faculty. Courses taught by full-time faculty average a course cap of 34 students at the undergraduate level and 26 at the graduate level; those taught by adjunct faculty average 24 and 21, respectively.

Course delivery methods seem to play a part in setting a course cap. For example, courses utilizing asynchronous discussion as the primary mode of instruction have an average course cap of 29 at the undergraduate level and 27 at the graduate level. However, courses utilizing video (e.g., video streaming) as the predominant mode of instruction have an average course cap of 57 and 55, respectively.

The institutions that have been offering online courses for 10 years or more have lower average course caps than those institutions that are newer to online learning. Thus, the average online course cap for experienced institutions (having

offered online courses for 10 or more years) is 23 students at both the undergraduate and graduate levels. Their less experienced counterparts (having offered online courses for less than 10 years) have an average course cap of 34 at the undergraduate level and 26 at the graduate level.

There also seems to be a difference in online course caps between undergraduate- and graduate-level programs. For example, the average undergraduate course cap is 30; it is 28 at the graduate level. This trend of lower graduate course caps is evident regardless of faculty type (full-time vs. adjunct), institutional ownership (private vs. public), or course delivery method (discussion vs. streaming video).

- Enrollments: Course caps are sometimes not an issue because of low enrollments. For example, an institution with a small number of online students may set a course cap at 45 but never really achieve it because there are not 45 students who could take that course at that time.
- Compensation levels: Faculty pay is sometimes tied to course caps. For example, the faculty member receives a base salary for teaching a course when the number of students equals the course cap (or less). For every additional student, the faculty member receives additional compensation. Operationally, this is only practical when it comes to adjunct faculty.
- Institutional characteristics: Depending on their character, institutions may deliberately set course caps that defy the norm (or the average). Thus, a small, private, liberal arts college may intentionally cap online courses at ten students to preserve a high level of student-faculty interaction; large, research-oriented institutions, by the same token, may employ several teaching assistants for one course and thus be able to set relatively high course caps.

Course caps should ensure that the course and program goals, along with institutional characteristics can be met and preserved.

Planning Considerations

Institutions should be careful when setting their online course caps because adopting the average course cap may not be the best solution. Just as the "C" grade portrays an "average" student, not every student strives to be at that level. Likewise, not every institution should strive to adopt the average online course caps. Course caps should ensure that the course and program goals and institutional characteristics can be met and preserved.

In order to meet and preserve program goals and institutional characteristics, many institutions reported consider the following when determining course caps:

- Course discipline: In many cases, course discipline mandated a course cap. For instance, an undergraduate English course may lend itself to having a larger course cap than an upper-level pre-med course. Respondents to the survey indicated that the course cap is often determined by department chairs (and sometimes even by individual faculty).

Quality and Cost-Effectiveness

It is important to note that course caps (average or not) are neither an indicator of academic quality, nor-cost effectiveness. On the one hand, an online course can be structured in a way to ensure that its objectives are met with a course cap of ten or 100 students. However, faculty often argue that a smaller number of students can help ensure more student-faculty interaction (and myriad studies indicate that this interaction can indeed yield higher learning outcomes and higher retention rates). Furthermore, faculty also note that some course delivery methods, such as those utilizing asynchronous discussion as the primary teaching tool, can become overwhelming for students when the number of discussion messages reaches exponential levels. Likewise, when it comes to cost-effectiveness, it is feasible that a course with ten students may cost a lot more per student than one with 100.

If we decide not to consider quality at all, then the issue of cost-effectivenes will most likely surface as the primary driver of the need to increase course caps. After all, to be able to offer online courses, institutions need to remain profitable. What it means to be profitable clearly depends on the unique circumstances of each institution. However, profitability is not only achieved by increasing revenues (i.e., adding more students to each course) but also by decreasing expenses (i.e., finding innovative ways to fund or decrease costs associated with administration, teaching, or technology). Achieving profitability may not be an easy task, but it is not mission impossible. For example, in 2003, the University of Phoenix Online achieved a sizeable net income ($110M) while maintaining a course cap significantly below the average (13 students).

If one of the most profitable institutions maintains one of the lowest course caps, one cannot help but ask if increasing the course cap will truly have a positive impact on profitability? Large course caps could make online courses and programs less appealing to prospective students, thus actually making the program less marketable. With that in mind, faculty and administrators alike should look at the bigger picture of revenues and expenses in order to ensure to sustainability and profitability of online programs. It may be that the size of an online course cap does not matter after all.

***Boris Vilic (vilic@duq.edu)** is director of technology at the School of Leadership and Professional Advancement at Duquesne University.*

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- **Lansing Community College** consolidated their messaging and file management systems.
- **NACUBO** selected a CMS platform to build existing and new content on their Web site.
- IBM is working with **University of California-Irvine's** Department of Earth System Science to construct a "virtual climate time machine," using a powerful new IBM supercomputer.
- RightNow technologies enabled the **University of Houston** to build a knowledge base that can be accessed via the Web.
- **Boston University** Administrative Computing Services (ACS) team has assured a high level of sytems uptime and automation.

Lansing Community College ▪ By Glenn Cerny

Expanding Services, Reducing IT Operating Expenses with Integrated IT Infrastructure

Entering the new millennium, Lansing Community College faced a trio of issues that threatened to stall growth and hinder our ability to deliver innovative programs and student services. Looming were declining state funds, competition from a new breed of for-profit higher education institutions, and an IT infrastructure that was increasingly fragmented and expensive to maintain.

In 2000, we developed and began to implement an IT strategy designed to expand and improve delivery of education services, decrease the cost of systems management and maintenance, and fundamentally transform the way in which students, faculty, and staff work and interact via technology on and away from campus. We also were committed to enhancing all students' access to and experience with technology—regardless of their majors. Fundamental to the plan was the implementation of an integrated messaging and file system that would make it easier for students, faculty, and staff to access and manage critical information.

Our three-pronged IT strategy focused on consolidating systems and reducing the number of vendors with whom we worked; implementing continuous improvement and reporting capabilities; and making our systems Web-accessible—a crucial requirement for a commuter campus.

Single-Vendor Approach

To reduce IT management and maintenance costs and achieve a fully integrated infrastructure for delivering information to our students, staff, and faculty, Lansing adopted a single-vendor approach. Oracle delivered the functionality we needed in a secure environment and could scale to meet our future needs. We also wanted the ability to run systems on Unix and Linux platforms, and Oracle could accommodate this requirement.

For integrated messaging and file management, we selected Oracle Collaboration Suite, which includes a relational database and provides users with access to integrated e-mail, voicemail, calendaring, file-sharing, search and Web conferencing capabilities from popular desktop clients such as Microsoft Outlook, and Web browsers and wireless devices, including PDAs and cell phones.

Building a Solid Foundation

Before implementing the collaboration system, we first consolidated 80 servers to approximately 35. Lansing's disparate systems had required experts in each application area, and the system could no longer scale to meet our growing needs. We also consolidated more than 4,000 desktop databases, enabling the college to more efficiently and accurately manage critical data.

The Oracle portal implementation, which runs on Linux and serves as the front end to our collaboration system, was another important building block in our IT strategy. We had the portal running in just two months, in time for Fall 2002 enrollment. Lansing's students enthusiastically embraced the portal. Within four months, more than 70 percent of our student population had a portal account.

Transforming Communication, Enabling Collaboration

With the foundation in place, we were ready to move forward with our integrated e-mail, voicemail, calendaring, file-sharing, and search capabilities. We started by migrating from Lotus Notes to Oracle Collaboration Suite, converting 2,200 staff and faculty members to our new e-mail system in May 2003. During the two-month migration, we provided workshop sessions and online learning tools to help users transfer their messages to the new system. Feedback on the transition was overwhelmingly positive, with staff members indicating that the process was seamless and relatively painless.

We also replaced our Meridian Mail system with Oracle's voicemail and fax capabilities.

The Meridian system was expensive and outdated, and we were outsourcing to Verizon for system maintenance, which incurred additional costs. At the same time, we were building a new campus and made the decision to deploy Voice Over Internet Protocol (VOIP) phones to avoid building a duplicate telephone system at the new facility. We also saved time and money by storing messages in Oracle Voicemail and Fax. Staff and faculty members are ecstatic about receiving their voicemail in an e-mail format, a capability that has improved responsiveness and productivity.

We are leveraging the Oracle Files system, which has shortened by two days each month the process of preparing for Board of Trustees meetings. Participants now receive their meeting materials electronically via an e-mail link well in advance of the monthly meeting. In another area, before we implemented the new file management solution, the 20 people involved in the budgeting process had to send countless e-mails with versioned budget attachments. It was difficult to determine who was making what changes, and someone had to consolidate all the versions. Now, the master document is stored on a secure server, and each person can edit the same version of the document from Web folders.

We have also implemented Web conferencing capabilities and, today, host 50-100 conferences monthly. The conferences, without question, saves time and increase productivity.

Cutting IT Expenses by $600,000

At Lansing, we faced our IT challenges head-on and crafted a solution that enabled us to expand services to students, faculty and staff while significantly cutting our IT management costs. We have reduced IT staff expenditures by $600,000 annually and have emerged with a streamlined, yet scalable, infrastructure that prepares us for a bright future.

Glenn Cerny (cernyg@lcc.edu) is chief information officer at Lansing Community College.

National Association of College and University Business Officers ▪ David D. DeLorenzo

When Everyone Writes for the Web

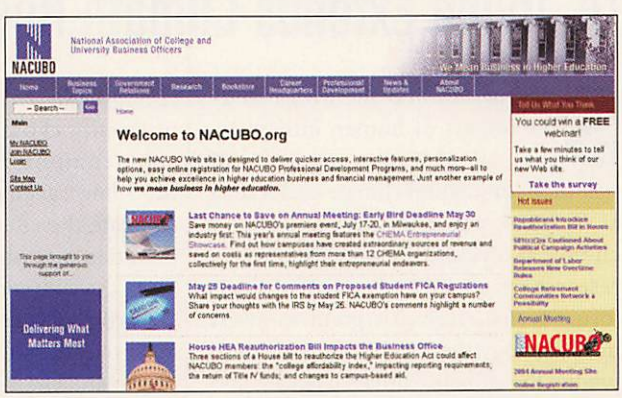
How do you include non-technical staff in the ongoing development of 2,500 Web pages? Believe it or not, you do not have to turn these staff members into Webmasters. A content management system (CMS) makes it fairly easy for staff to create and update Web content. At the same time, the system provides the tools that administrators need to control Web development and protect information. As the National Association of College and University Business Officers (NACUBO) has found, a CMS is not only a good idea when managing a content-rich Web site, it is indispensable.

In the redesign of its Web site, NACUBO considered content management to be one of the most challenging and important parts of the development strategy. We carefully evaluated several leading content management systems in the association market and within higher education. Ultimately, we selected the Ingeniux CMS platform on which to build our new site. We launched the new NACUBO.org site on March 8, 2004, and appreciate the benefits of using a content management system.

The Need for Content Management

Like many other organizations, prior to using a CMS, NACUBO realized that its Web site often contained out-of-date or obsolete information, possibly dissuading visitors from returning as often as we would like. It is no secret in today's virtual world that visitors might be turned off or confused by seeing information on a site for an event that has already been held, or reading about a discontinued program, product, or service. NACUBO's original process for content development involved 20 to 30 staff members from a variety of areas sending requests to two technical staff members, without any priorities, workflow, or strategy. This created a bottleneck effect that frustrated those on both sides of the process.

Maintaining accurate, relevant, and error-free Web content is critical, because the site is a direct reflection of the organization. NACUBO decided that the best strategy for ensuring that members and partners view us at our best was to implement a content management system, enabling each staff member to maintain his or her own content.


NACUBO
National Association of College and University Business Officers
Welcome to NACUBO.org
Delivering What Matters Most

NACUBO.org is redesigned and powered by Ingeniux CMS

Selecting a System

The key for NACUBO was to find a content management system that the staff would find easy to use. We did not want a system that would require the content authors to do HTML programming or learn complicated new systems. To get total buy-in, we needed a system that would be understandable and that would incorporate the tools our staff already worked with.

Some organizations build their own "homegrown" CMS or co-opt an open source solution. However, building a CMS was not even an option for NACUBO. From cost, risk, and functionality perspectives, it was clearly better for us to purchase a commercial CMS. We chose to focus our technical resources on extending and integrating the CMS, rather than reinventing it. Taking this approach, the Ingeniux platform enabled us to develop and integrate our member management system, and still hit our launch date.

Evaluating content management systems can be confusing. There are a lot of vendors and the range of systems varies greatly. We looked at how the CMS would help us reuse and reformat content, workflow and user management, and publishing capabilities. We also studied the vendor's technology approach: Did the company adhere to open standards, or were the technology and file formatting proprietary? We were wary of systems that could lock us in or make it difficult to migrate content to new systems. Lastly, we evaluated business questions, such as the vendor's viability and success in our market. Any product we chose would have to earn high marks in all of these areas.

Content Management In Practice

How is it working? The staff was trained on the system in January. Within 45 days they had built, edited, organized, and published more than 2,500 pages of Web content.

The Ingeniux tool provides an HTML editor that enables our staff content authors to work within a simple word processing template, with the same functions and buttons that they use in their everyday work. Ingeniux also supports drag-and-drop importing from MS Office and other applications. Since most content published on the Web originates from other systems, the ability to easily import information is extremely important.

One of our key tasks in implementing the CMS was to develop a schedule for updating and maintaining the site content. To do this, we needed to identify the sections that frequently require updates: who should edit the content and approve the updates, and how often each section should be updated. The workflow system that is built into the CMS enables us to track who each page is assigned to, the workgroup that they belong to, and the status of the page.

By allowing content authors to make their own changes, NACUBO now has a site that is robust, frequently updated with fresh content, and fully integrated with all back-end operations. Using Web services, Ingeniux CMS integrates fully with our membership database to create database-driven pages for eCommerce and to deliver products, programs, and services. The CMS also allows NACUBO to password-protect the site on a page-by-page basis for our membership.

Our staff is working well with the CMS, and we update our site daily. The site has never had more content or functionality. We have learned from experience that we could not support the quality of Web site that we currently have without a content management system.

Mark Olson, NACUBO's executive vice president and COO, points out a bonus to the CMS implementation: "With our IT team now free to focus on new projects rather than on supporting Web authoring, NACUBO can develop a more ambitious roadmap and better use technology to serve members."

David D. DeLorenzo (david.delorenzo@nacubo.org) *is director of Distance Learning and Web Strategy for NACUBO.*

University of California-Irvine ▪ By Charlie Zender

UC Irvine Extends Climate Research With IBM Supercomputer

Scientists around the world study the impact of human influences, such as global warming and pollution, on natural climate cycles such as El Niño, polar-ice movement and chemical cycles. Earlier this year, researchers at the University of California-Irvine received a grant to invest in technology that would allow them to predict the climate, climate changes, and climate extremes that will affect Earth's inhabitants in future decades. The university chose a powerful new IBM supercomputer, the Earth System Modeling Facility (described below), to simulate the effects of global warming, pollution and other climate stresses for up to three hundred years in the future.

Earth's weather and climate result from an intricate and complex interplay of physical, chemical, and biological processes of the atmosphere, oceans, and land surface. The global environment that supports life on Earth absolutely depends on the coupling of these Earth system components. This linking across ocean/land/atmosphere places significant constraints on the architecture of computers being able to solve the problem efficiently. It's important to predict future climate well enough in advance to understand now how best to mitigate environmental changes that may have potentially

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adverse, even disastrous, effects on the planet and its living organisms.

In fact, growing evidence suggests the ocean-atmosphere system that controls the world's climate can lurch from one state to another in less than a decade—like a canoe that's gradually tilted until suddenly it flips over. Although it's still uncertain how close we are to the threshold, abrupt climate change may occur in the near future, possibly overwhelming many societies with the need to rapidly adapt, and upsetting the geopolitical balance of power.

Climatologists at UC Irvine have been using computer simulations to track the environmental effects of phenomena like increasing fossil-fuel emissions, aerosols, and disappearing sea ice for many years. This complex research was always done through national supercomputing centers such as the San Diego Supercomputing Center. But with the emergence of more innovative technology applications and newer simulation capabilities, we realized that having our own dedicated supercomputer would dramatically increase the quality and scale of research conducted by our department.

Our new computer system, the Earth System Modeling Facility (ESMF), gives us the freedom to attempt more ambitious computing projects with an almost endless number of variables, including well-known factors, man-made pollutants such as car exhaust, and more obscure influences, such as volcanic disturbances and underwater ecosystems.

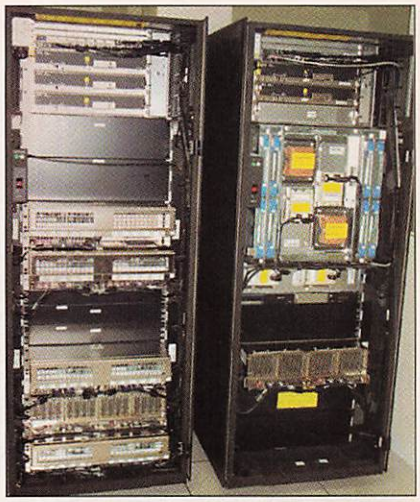
How It Works

The supercomputer consists of seven IBM eServer p655 AIX-based systems, each with eight POWER4+ microprocessors connected by IBM's clustering technology—and one IBM eServer p690 system with thirty-two POWER4+ microprocessors. This infrastructure delivers a freeze-frame of the changing world of high-performance technical computing and is designed to provide the sustained compute capability, speed, and storage capacity necessary to understand and predict atmospheric interactions with the Earth. The supercomputer allows us to pursue data-intensive research involving large geophysical data sets from current and next-generation numerical models and satellite observations.

First Discovery

Our first project involves the emission and long-range transport of mineral aerosols. We used the ESMF to probe the physical causes and biogeochemical and climate consequences of large desert dust particles, and found a huge discrepancy between previous simulations, which underestimated the abundance of these particles, and our observations. Remote regions such as the Southern Ocean near the Antarctic may receive inputs of dust-borne nutrients like iron much less regularly, and in much larger-sized particles, than currently thought.

The ESMF makes possible new simulations that will include the complex, time-consuming, physical processes we have shown are responsible for greater emissions of large desert dust particles. We will soon run new, coupled simulations, which address the previous biases of dust on climate and biogeochemistry. These will have fewer surfaces cooling, more atmospheric heating, and more variable dust fertilization of ocean biogeochemistry than current models.



The power of pSeries Supercomputers work together in clusters to help predict the effects of global warming and pollution on the Earth's atmosphere.

Our improved dust distributions will strengthen radiative feedbacks in dust source regions and weaken them afar. We believe these results will show that dust is more capable of drying out arid regions, and generating more dust than previously thought.

Charlie Zender (zender@uci.edu) *is assistant professor of the Department of Earth System Science at the University of California-Irvine.*

University of Houston ▪ By Betty Roberts

Transforming Your Web site Into a 24/7 Service Center

The University of Houston was growing, and we had more current and prospective students asking questions about more things than ever. The volume of phone calls and e-mails we were getting began overwhelming our staff. And students were having a harder time getting the answers they needed.

Potentially, the Web offered the solution. If our Web site contained all the information that students needed, then phone and e-mail volume could be brought down to manageable levels. Plus, students would be able to find answers to their questions at 3:00 a.m. as easily as they could at 3:00 p.m.

However, several obstacles stand between any university and the Promised Land of Online Answers. Those obstacles include:

Navigation. Most university Web sites have a good deal of information already. The problem is that students can't always find the needle they seek in the haystack of content.

Fragmentation. The various functional areas of a university—financial aid, registrar, bursar, athletics, academic departments—traditionally operate independently of each other. That makes it difficult, if not impossible, to manage information in a centralized manner.

Relevance. You can speculate about what you think students will want to know, but the effectiveness of your Web site depends on allowing students' actual, documented information needs to drive your online content.

Awareness. You can build it, but they still may not come. In addition to having all the information students need on the Web and making it easy for them to find, they have to know the information is there.

At UH, we overcame these obstacles with a combination of the right technology and the right strategy.

After a review and a request for proposals, we determined that RightNow Service from RightNow Technologies would be our technology platform. RightNow enables us to build a knowledge base that can be accessed via the Web. Unlike conventional "FAQs," the RightNow knowledge base makes it easy to search through hundreds of knowledge items using keyword search, plain-language queries and/or category browsing. Site visitors can quickly zero in on the specific piece of information they're looking for. UH staff can also use the knowledge base to give fast, accurate answers over the phone or via e-mail.

We had each functional area of the university assign its own project liaison and content manager to determine how to present the knowledge base within its section of the UH Web site and how to use RightNow internally for phone and e-mail. Because the knowledge base itself would be in common, site search results would show users all relevant answers across all functional areas.

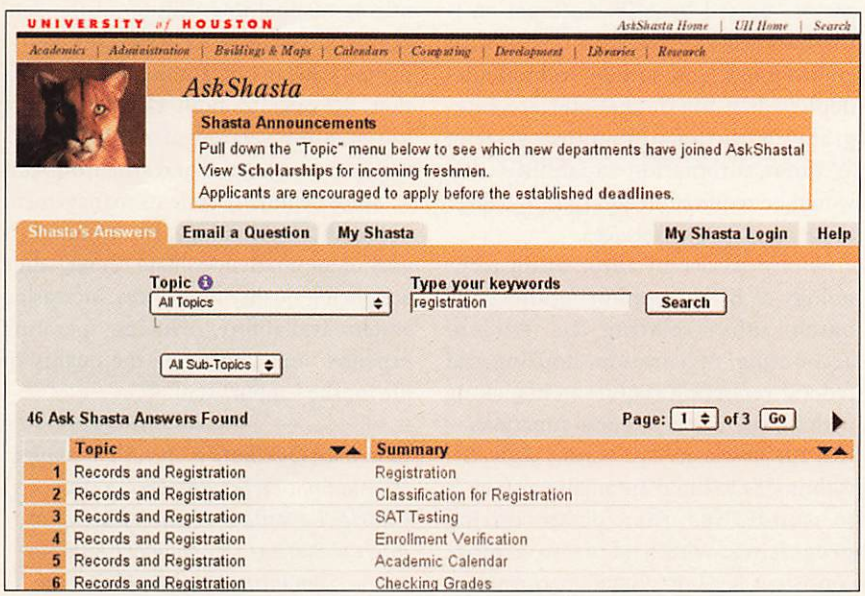
We put processes in place to ensure that our Web content was truly driven by customer needs. Often, after responding to a phone call or e-mail inquiry, staff members realized that their answer would make a valuable addition to the knowledge base. With our system, they can quickly submit their answer to an assigned knowledge base or Web site content manager. This approach, effective for building a knowledge base that is both comprehensive and highly relevant to students' needs, also removes the burden of trying to figure out exactly what students want from content managers.

We branded the system, naming it "Ask Shasta," after UH's cougar mascot. We put links to the Ask Shasta system in prominent positions on the UH home page, and promoted it through UH publications and other programs. This promotion was critical for gaining the necessary mindshare across our entire student population.

The impact of the Ask Shasta system has been tremendous. Use of the Web by students and other constituencies rose dramatically from 11,622 "answer views" in November 2002 to 21,917 in October 2003. As a result, phone calls have decreased substantially—in some cases, by as much as 25 percent. In addition, entry-level department employees can use the knowledge base to answer questions instead of having to wait for subject-matter experts to respond to the queries. This saves UH money, and allows department experts to focus on their primary work responsibilities.

And, because they've been reviewed and approved by assigned content managers, the answers on our site are always consistent and accurate.

The lesson for other universities is that the Web can indeed be a powerful channel for serving the broad information needs of students and other constituencies. Conventional approaches to Web content creation and management, however, are insufficient for exploiting the full potential of the university Web site. Instead, more sophisticated knowledge management technology and a more strategic, institution-wide approach to content and communication are essential.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2 Records and Registration Classification for Registration
3 Records and Registration SAT Testing
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University of Houston's knowledge base offers answers to registration questions and other topics.

Betty Roberts (BJRoberts@central.uh.edu) *is associate vice president of technology support services at the University of Houston.*

Boston University ▪ By Lawrence Ouellette and Charles La Salle

Automation Technology at Boston University

Higher education leaders are directing their institutions to incorporate the strategies of business school academics to increase operation efficiency and maintain a high level of service to administration, faculty and student "customers." Ensuring the reliability of an institution's Information Technology (IT) systems, which today underpin nearly all facets of campus life, is critical to achieving these objectives. Increasingly, advanced automation technology is enabling universities such as Boston University (BU) to achieve tight control over the performance of their technology infrastructures, with greater consistency and fewer resources.

BU's Administrative Computing Services (ACS) team has taken an active role to assure a high level of systems uptime and automation in support of the university's administrative computing requirements. ACS plays a key role in supporting the university's population of more than 30,000 students, who come from all 50 states and 135 countries. Additional international student federal registration and reporting mandates enacted after September 11, 2001, make performance and availability critically important to serving BU's foreign student population, nearly 5,000 students, each semester.

In the late 1980s, ACS's mission was to establish an unattended data center that would improve the overall availability and reliability of its computing environment and better serve its user community. Automation of BU's performance monitoring and service management operation in the early 1990s was a fundamental requirement for achieving this objective. To support its unattended data center initiative, automation systems were required to:

- Ensure a high level of systems availability;
- Reduce the potential for human error by enabling automation routines for specialized and complex system requirements;
- Notify university staff immediately in the event that a system issue could not be corrected automatically.

After reviewing its options, the ACS team selected the AF/OPERATOR automation system from Candle Corporation to build a set of automation rules and routines for its mainframe and distributed environments. AF/OPERATOR is a performance and console automation system that addresses a critical data-center need to reduce human error and respond as quickly as possible to system events displayed on the console.

The Administrative Computing Services' automation capabilities manage all system alert activity for zSeries mainframe, Unix, and Windows servers hosted by ACS. Automation is the backbone of the ACS operational environment and so new technologies deployed in the data center are integrated with the automation system. Without automation capabilities, BU would be required to add staff to deliver these same quality services.

A critical use of automation technology at BU is monitoring the 2,500 batch jobs—relating to student accounting, registration, housing and federal reporting requirements, along with all the usual business functions—that the university's ACS runs daily. BU is thus able to build automatic responses to conditions that occur during processing, which leads to a more consistent level of systems performance and management.

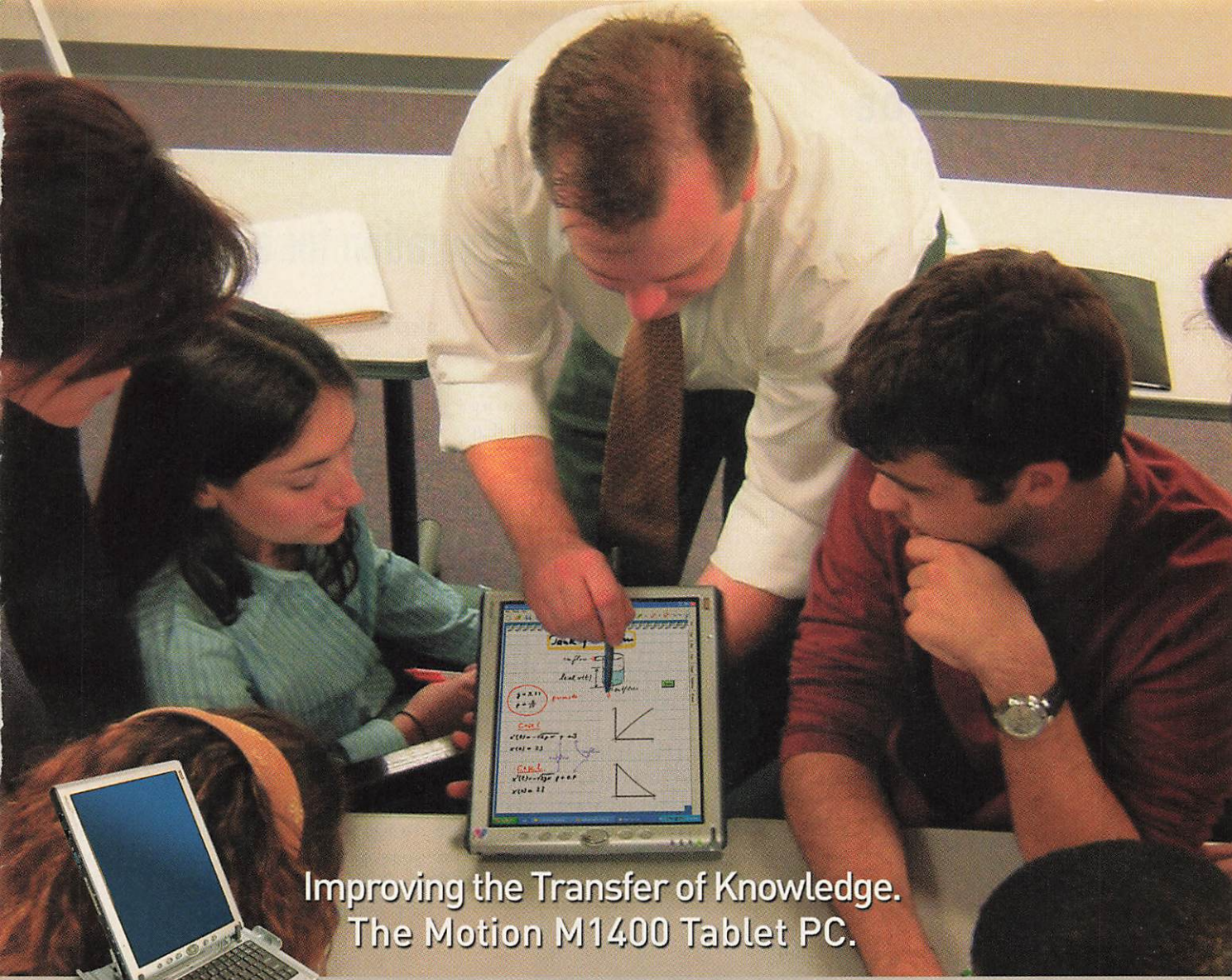
The systems threshold management capabilities allow ACS to monitor for fluctuations in critical system resource metrics and automatically react and/or notify appropriate personnel to take action before a serious problem occurs. Suppose, for example, a non-interruptible power supply generates an event indicating that the ACS department has lost building power and is operating on batteries. The automation tool notifies active online users and support staff of the outage, and then starts the process of executing a managed shutdown of the university's administrative business systems, rather than risking database integrity waiting for an abrupt crash when battery power would be exhausted.

BU's automation system simplifies remote data center management and increases staff productivity and system availability, while at the same time minimizing manual intervention in the data center. Given that AF/REMOTE is the primary means of automated notification, BU operates both a primary and a hot-standby version of AF/REMOTE, which are networked and synchronized.

BU's automation system simplifies remote data center management and increases staff productivity...

Since deploying systems management automation technology, BU achieved its goal of an unattended data center, while enhancing quality of services, increasing system availability, reducing operating expenses, and improving the quality of life for the support staff.

***Lawrence Ouellette** is operations analyst III, Automation Services Group, and **Charles La Salle** is assistant director of Internal Systems Development Administrative Computing Services, University Information Systems at Boston University.*



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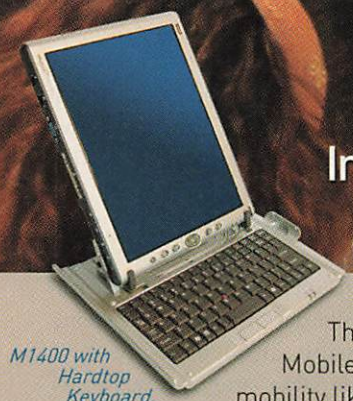

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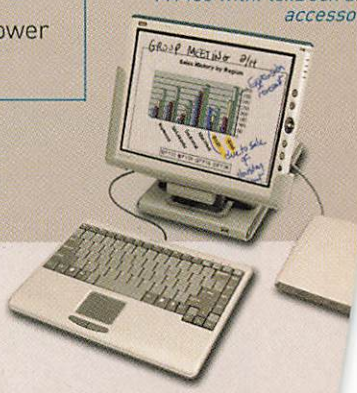

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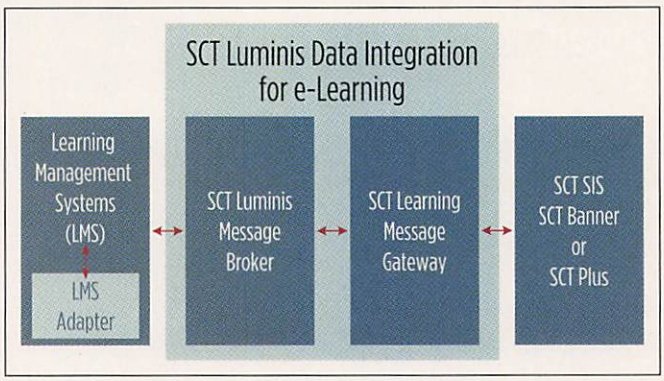
SCT Luminis Data Integration for e-Learning

While 80 percent of institutions have implemented some type of integration between their student information and learning management systems, it is estimated that fewer than half have invested in creating the full functionality available through real-time data integration. Their limited integration can create problems when student information and learning management systems overlap functionally—e.g., between registration and grading—because it encourages "shadow data" that might easily fall out of synchronization with the institution's primary data repository.

SCT Luminis Data Integration for e-Learning provides real-time, standards-based data integration between common learning management systems such as those provided by WebCT and Blackboard with SCT Banner or SCT Plus administrative systems. This simplifies administrative tasks and reduces data entry redundancies for faculty; decreases grading policy errors for administrators; and provides students with seamless, timely access to grades and other data stored in the student information and eLearning systems.


SCT Luminis Data Integration for e-Learning
Learning Management Systems (LMS)
LMS Adapter
SCT Luminis Message Broker
SCT Learning Message Gateway
SCT SIS SCT Banner or SCT Plus

The components of the software packages that support messaging and synchronization within the SCT Luminis integration solution.

Southern Alberta Institute of Technology (SAIT), is among the product's early adopters. SAIT's implementation will provide a single sign-on and data integration services between the institution's SCT Luminis, SCT Banner, and WebCT systems. Mark Hoye, manager of software services at SAIT, observes, "SCT Luminis Data Integration for e-Learning eliminates the need to manually enter course and student data into our WebCT system. This enables our learning management system support team to focus on supporting faculty and students." He adds that the single sign-on facility will simplify how faculty and students access the WebCT system and provides SAIT with a connected enterprise system that enhances the learning experience. "In addition to providing additional value from the pedagogical perspective, the integration of the three systems is driving down our transaction costs. The software automates the eLearning rostering processes, enabling us to eliminate costly, error-prone, and time-consuming manual data entry practices."

The solution employs the SCT Luminis Data Integration architecture, an open, interoperable, and extensible data messaging system. Institutions implementing SCT Luminis Data Integration for e-Learning gain the benefits of a flexible software integration resource that can extend the life and utility of their applications. Institutions and learning management system providers who are SCT Integration Partners can develop and maintain application software adapters that work with the product.

Real-Time Data Messaging Capabilities

The standards-based, hub-and-spoke design of the SCT Luminis Data Integration architecture interconnects disparate systems and legacy applications. At the heart of this open architecture is the SCT Luminis Message Broker, which incorporates the Sun ONE Message Queue. The SCT

Luminis Data Integration for e-Learning SDK contains specifications that enable institutions and SCT Integration Partners to develop application adapters that communicate with the SCT Luminis Message Broker. Predefined events trigger the transmission of data messages from an application to the message broker, which then publishes those messages to the list of networked applications denoted as subscribers. The SCT Luminis Message Broker also tracks which application is the authoritative source for a given data set to ensure the data integrity of that source.

The product brings the benefits of real-time, event-triggered, data message integration between an institution's learning management and student information systems.

Students, faculty, and administrators can benefit from real-time synchronized data, especially when these data are important to their individual needs and performance objectives. The solution ensures data integrity in support of inter-office processes for course catalog management, class scheduling, class enrollment, registration add/drop, grade books, and other academic information sources.

SCT Luminis Integration for e-Learning is the second real-time integration solution released by SunGard SCT. SCT Luminis Data Integration for e-Procurement, for coordinating purchasing, accounting, and financial management operations, was released earlier this year.

For more information about ***SunGard SCT***, visit www.sct.com.

FEATURED PRODUCT ■ EBRARY EXTEND

Powerful Content Integration and Research Capabilities

A new set of free XML-based Web APIs, called eXtend, enable ebrary customers and partners to seamlessly integrate full-text book content and advanced research functionality using their own interface, existing infrastructure, and brand. With eXtend, ebrary associates such as academic libraries, universities, and eLearning companies can provide a richer end user experience and better accessibility. The APIs, released last month, are already in use by diverse organizations including Staffordshire University, ITT Technical Institutes, Cyberlibris, R.R. Bowker, and Blackwell's Book Services.

eXtend provides access to the high-level building blocks of the ebrary system: Partners and customers control behavior and display while ebrary provides the underlying technology. On a basic level, ebrary's APIs are Internet URLs that customers can access from their Web sites or programs. These URLs take a standard, documented form, with optional parameters that customize the instruction or request. The ebrary system returns result codes or information as formatted XML. eXtend is designed for intermediate-level Web programmers familiar with W3C-standard Internet protocols, URLs, XML, and cookies.

"Since integrating ebrary content and research tools within our own Web site using eXtend, we have seen a significant increase in usage," said David Parkes, head of Learning Support and Information Services for Staffordshire University. "With ebrary's new APIs, students can now access valuable book content from leading publishers and take advantage of powerful research tools from any computer, without leaving the Staffordshire site."

ebrary's core business is licensing full-text book databases to libraries and other institutions worldwide under a simultaneous, multi-user access model. With eXtend, ebrary customers and partners can integrate all of the ebrary content to which they subscribe within their own Web sites, portals, or programs. ebrary also licenses its database technology to organizations that need to distribute their own content securely online.

Available in multiple academic and general interest subject areas, ebrary databases contain more than 45,000 full-text books, maps, reports, and other authoritative documents from over 180 leading academic, trade, and professional publishers. ebrary is continuously expanding the number of titles in its collections, and customers receive regular content updates at no additional cost during their subscription term.

ebrary eXtend enables customers and partners to offer a superior research experience in an environment that seamlessly integrates with their existing digital resources and Web properties. Key features include:

- Remote, Single Point Access—End users can access ebrary content through a specified Web property at any time, from anywhere.
- Single Sign-On—Seamless user authentication removes barriers associated with multiple data sources, passwords, and other authentication mechanisms.
- Support for OpenURL—ebrary content may be included in OpenURL initiatives, for example, ebrary may be specified as an available target for an OpenURL link resolver.
- Support for Federated Search—This feature allows end users to search seamlessly through ebrary content and multiple data sources. ebrary may be incorporated

as a Z39.50 search participant.

- ebrary Search—The ability to set search parameters, determine types of searches, and place the search bar on any Web property.
- Localization—Enables the user interface to be offered in English, Spanish, or Portuguese.
- Bookshelves—A feature allowing the user to create bookshelves and pre-populate with relevant content.
- Color Modifications—Color scheme customization of many interface components.
- Customizable Research Tools—Customers can modify the ebrary InfoTools menu and integrate all online resources. InfoTools enable end users to interact with every word or phrase in every document.

"eXtend enables partners and customers to take full advantage of our content, technology, and capabilities to literally embed ebrary into their own portals and Web-based services," said Christopher Warnock, ebrary's CEO. "We expect organizations that leverage eXtend to see a higher amount of usage through better integration and thus realize a greater return on their investment."

For more information, visit www.ebrary.com/libraries.

EDUCATOR'S REVIEW ■ BY BILL GARLAND, MCMASTER UNIVERSITY

Real-Time Screen and Audio Recording in a Flash

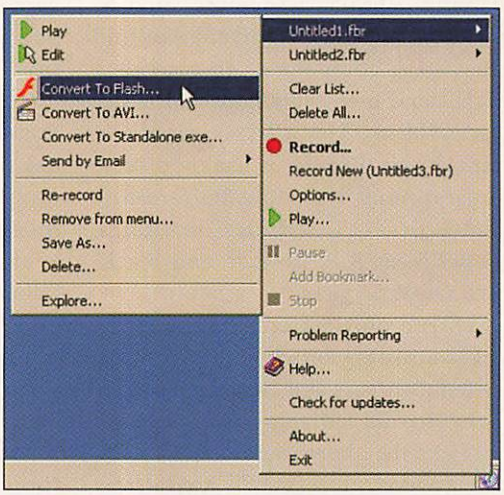
Need a tool to capture some screen action with audio but haven't got a lot of time to read reviews? Don't worry, I'll be done in a flash, just like the product itself. BB Flashback is a real-time screen and audio recording program that I found on the Web a few months ago when I was searching for distance learning tools to bridge the distance among nuclear engineering people in Canada. I was looking for a tool like BB Flashback (www.bbsoftware.co.uk) to aid in that.

I hope my review will be meaningful for you, given that I did not spend a whole lot of time testing the competition. But that may be the main attraction of FB...it did what it claimed to do right out of the box and I was away in a ...Flash! I tried a few others but tripped over some issue or another and I moved on. Some were far more obtuse and one even hung my system (an IBM notebook running Windows XP). Please, I don't have the time for that nonsense.

I found two main categories of tools suitable for creating help and demonstration movies. One category is what I would class as editors or builder tools. Those certainly have their place in delivering top-notch help systems, scripted lessons and whatnot. So I passed over all those tools, not because they were flawed, but because they were not the tools I was looking for. The second category is capture tools. This is what I was interested in. I wanted to record and post on the Web a simple demonstration of a CD-based course that I was responsible for, since I would not be doing my normal chalk talk in front of a live audience. As usual, I had *zero* time to do the job.

Enter BB Flashback; just the ticket for getting a short show and tell up on the Web.

Getting the program up and running is dead simple; just download, run, follow a few simple dialogues and away you go. BB Flashback runs in the background as you run through your tutorial. Hit a hotkey and the session is saved to a local file with an fbr extension. This can be edited and exported to a standalone exe, an avi file or a Macromedia Flash swf file, complete with an associated html page ready for Web posting. Slick. The file size was about 1 MB/minute for the swf file. I posted two short intros for one of my courses on the Web at http://nuceng.mcmaster.ca/ep6p3/ep6p3index.htm if you want to see my amateur effort. I wonder how many days it would have taken me to handcraft a nice demo with animation tools? I did it in about 30 minutes from the time of downloading BB Flashback. And that included getting familiar with the tool. One of my colleagues commented: "Excellent! This makes a difference." At the time of recording, I did not have a proper microphone so I just used the tiny mic in my laptop. Sure, there are animation tools out there to do this professionally, but that takes a budget, time, and effort. (Translation: It won't happen.) With BB Flashback I can get dozens of little demos (albeit a bit rough around the edges) out to the students in the time it would take to get a single professional one out. As a teacher, I will take that trade-off any day.



BB Flashback provides a simple interface for audio and screen recording.

You can edit the recorded sessions, though the editing tools are a bit clunky. But that is not the main raison d'etre for this product and I would not de-rate it for that. I have contacted the developers and it appears that they are working hard to add new features. The most recent version, for example, adds enhanced playback tools in the swf file. I would like to see more enhancements (like better annotation tools, easier editing of audio, more options to create low-resolution Flash files.) but none of those are show-stoppers, especially since they appear to have a vigorous development program and so, it is likely only a matter of time before that feature you want will appear.

Another tool I need is a cheap white board so I could "lecture" on the white board (perhaps an equation derivation, where the *process* of deriving the equation is just as important as the derivation itself) while recording it with BB Flashback. Then I could post that, allowing me to skim over it in class so I could focus on other concepts and on discussion. Oops. I just talked myself into getting a tablet computer. Just think about it: with a tablet computer and BB Flashback, you can draw out ideas as you think out loud and post them easily. How cool is that?

I really like the tool. The product does exactly what BB said it would, it is reasonably priced and very intuitive to use. Well done to BB. I just need to talk my admin into getting me a tablet computer. I think I will use BB Flashback to make a quick demo of how it can be used in class and e-mail the developers the exe file to view.

Bill Garland (garlandw@mcmaster.ca) *is a professor in the department of engineering physics at McMaster University in Ontario, Canada.*

Digital Tweed, *continued from page 22*

Western Reserve University, describes as "quality, connected places."

Of course colleges and universities have always struggled to be "quality, connected places." The core of the connection in academe (the network, if you will) has been scholarship: journals, books, and professional correspondence, along with academic meetings and collegial banter, are the key elements of academic connectivity. The highly connected among us are what the sociologists of academe describe as cosmopolitans, focused on and identifying with our professional identities (Chaucer scholar, mathematician, psychologist, or even CIO) over our institutional affiliations (professor or administrator at Acme College).

The Internet and the Web, of course, have helped to redefine the meaning of connectedness, and have also provided us with new metaphors to describe it. But it was the late Clark Kerr, a labor economist by training, president of the University of California system in the 1960s, and a key force behind the influential Master Plan for Higher Education in California, who offered early predictions about what IT would mean for academe and the university's relationship with local and national economies and communities. Writing in 1963, Kerr observed that "what the railroads did for the second half of the last century and the automobile for the first half of this century may be done by the second half of this century by the knowledge industry: that is, to serve as the focal point for national growth. And the university is at the center of the knowledge process."

So let's connect the digital dots. Four decades ago Kerr predicts that information technology "will be the focal point for [future] national growth," and that "universities are at the center of the [IT] process." Now back to Ed Morrison at REI: if the essential elements of convergence in the manufacturing economy were labor, capital, and material, Morrison's work suggests that the critical converging elements for the information economy are brainpower, innovation, and "quality, connected places"—resources found at two- and four-year colleges and universities.

Taken together, Kerr and Morrison suggest that in the information economy, colleges and universities can (indeed should!) be actively engaged in the economic development. And this engagement goes beyond the traditional reports that chart the ebb and flow of industries and opportunities.

A key element of this "new engagement" is the network—both the physical network and the network as a metaphor. The physical wired network can be seen as an extension of the traditional barriers that have separated campus and community and it also has limits. However, the movement to wireless makes the network porous, open, and accessible.

The emerging examples of campus-community, network-centered engagement are interesting These projects are coalescing under the banner of Digital Cities. In Cleveland, the OneCleveland project provides a compelling example of university leadership linked to technology engagement, economic development, and civic commitment. Other similar initiatives are emerging in the US and elsewhere in Europe and Asia.

Colleges and universities will not necessarily lead the civic efforts to convert 20th century manufacturing centers into 21st century digital cities. But they have an important role to play, offering the key elements of brainpower and connection that will be essential in these initiatives. The network is an element of—and a metaphor for—these initiatives.

Casey Green (cgreen@campuscomputing.net), *founding director of the Campus Computing Project (www.campuscomputing.net), is a visiting professor at Case Western Reserve University.*

Campus Enterprise,

continued from page 24

ago, daily mail volume (at the central mail server) ranged from 18,500 messages a day to 5.9 million messages a day. This past April folks reported volumes ranging from 22,300 messages a day to 9.2 million messages a day. For some folks these numbers were estimates, for others they were real counts. Discounting some reports that were very different from all of the others, folks were reporting an increase in mail volume over the year between 25 and 116 percent. A 25 percent increase over last year is a lot more e-mail. A 116 percent increase is a lot more e-mail!

Then, I asked folks to report or estimate the percentage of e-mail that was spam. Their estimates ranged between 25 to 80 percent (again dropping a couple of outliers). That's a lot of garbage running around the Internet and making us less productive.

Most of my reporting colleagues indicated that they are currently running some kind of anti-spam software for their incoming mail. Most of them also indicated that taking advantage of the anti-spam capability was an opt-in option for their e-mail users. A few brave souls had implemented opt-out options and a couple of the places with huge mail volume are talking about automatically eliminating some e-mail (never to be seen again) that has a very high probability of being spam. In our communities, simply junking mail that looks like junk rather than sending it to its final destination is a controversial step.

I don't want to get bogged down in unnecessary or garbage e-mail. I don't want to continue to have to add mail server capacity because of junk mail. I suggest that it is time, as a community, that we accept, as a best practice, aggressive anti-spam actions. Let's stop living with e-mail as a "killer app."

Annie Stunden (stunden@uwisc.edu) *is chief information officer and director of the Division of Information Technology (DoIT) at the University of Wisconsin-Madison.*

Managing Storage,

continued from page 42

critical conditions that is used to evaluate any digital content creation tool is its ability to create SCORM-complaint packages. As this rationale is explained to faculty, the notion of learning object reuse will begin to enter into their consciousness and into course planning considerations. As Purdue moves towards full-fledged deployment of a single enterprise learning management system, it can be predicted that the awareness about learning object reuse will eventually infiltrate mainstream policymaking. It is not unimaginable that the number of reusable learning objects faculty contribute to repositories will become a factor in tenure and promotion. Learning object repositories such as MERLOT (http://www.merlot.org) have already paved the way for such innovative institutional policies by implementing peer-review based rating schemes for evaluating the quality of the learning objects contributed.

Planning Considerations

It is not my purpose to claim that the diffusion of reusable learning objects into mainstream teaching and learning is without problems. Clearly, there are several serious issues that must be addressed, such as digital rights management, integrated tool design, and faculty education about global eLearning standards. These issues not-withstanding, there needs to be a concerted effort towards involving instructional designers and faculty alike to have any chance of tackling the storage problem before it assumes epidemic proportions. The solution lies in adopting innovative, bold, and aggressive strategies like the learning grid. Clearly, global eLearning specifications such as those proposed by IMS provide an excellent backdrop to begin this charge. The time to act is now—not after the next major storage alert has crushed resource planners at educational institutions.

Krishna P.C. Madhavan, Ph.D. *(cm@purdue.edu) is the lead digital media developer in Information Technology at Purdue University.*

Reflections,

continued from page 62

references, examples, graphics, and multimedia to enhance the learning process. Whether on the Web, in the university's electronic resources, or a part of ones' personal collection of reference material, it is very hard to find quality material that meets the needs of a course. When a successful search *is* made, the CCS would save the search strategy as part of the course so it could be repeated if the course is updated. It could also do proactive searching, periodically looking for new material for your course.

Learning all the nuances of a search engine would improve searching somewhat, but a powerful search by example interface is needed as part of a CCS. It would use the same interface to search all information sources. The CCS would accept natural language, fill-in-the-form, or Boolean searches. Its normal mode would be to display a dozen or so best hits and have you rank them for quality. The CCS would then get hits more like the ones ranked high and less like the ones ranked low. After a few iterations of this, you'd be getting hits that were superb.

The interview process that helped build the structure of the course would help build the content for each lab and lecture, including printable and electronic course materials. HTML, XML, Word, PDF, PowerPoint, and other file formats could be included in a course directly or the CCS could help build Web pages and slide shows. The inclusion of pedagogical rules, course content-specific information, and APIs to instructional technology applications would enable the CCS to organize Web pages and slide shows, making them easier to build and more likely to include multimedia and other advanced features—while creating courses that are more logical and pedagogically sound.

Learning management systems are now pretty good at managing courses. It's time we had software that creates something for them to manage.

Howard Strauss (howard@princeton.edu)

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Mark Sande
Publisher
818-435-5426 phone
818-734-1522 fax
msande@101com.com

ADVERTISING SALES

Navid Davani
Western Sales Manager
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PRODUCTION

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Production Expeditor
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CONFERENCES

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Conference Sales Director
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Xythos	29	(888) 4-Xythos	www.xythos/4education

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EDITORIAL INDEX

COMPANY/ORGANIZATION	PAGE	URL
Apache	12	www.apache.org
BB Flashback	55	www.bbsoftware.com
Blackboard	36	www.blackboard.com
Candle Corporation	52	www.candle.com
Desire 2 Learn	35-36	
IBM	48, 50	www.ibm.com
Ingeniux	47	www.ingeniux.com
Macomedia	55	www.macromedia.com
Mellon Foundation	15, 35	www.mellon.org
Oracle	46, 47	www.oracle.com
RightNow Technologies	50, 51	www.rightnow.com
Sony	19	www.sony.com
Sungard SCT	54	www.sct.com
Unicon	35-36	www.unicon.net
WebCT	36	www.webct.com

COLLEGE/UNIVERSITY	PAGE	URL
Acme College	57	www.acmecollege.com
Arizona State University	36	www.asu.edu
Boston University	46, 52	www.bu.edu
Duquesne University	43	www.duq.edu
Harvard University	22	www.harvard.edu
Indiana University	15	www.indiana.edu
Lansing Community College	46, 47	www.lansing.cc.mi.us
McMaster University	55	www.mcmaster.ca
Park University	10	www.park.edu
Purdue	40	www.purdue.edu
University of California	10, 57	www.universityofcalifornia.edu
University of California-Irvine	46, 48, 50	www.uci.edu
University of Florida	25	www.ufl.edu
University of Houston	46, 50, 51	www.uh.edu
University of Michigan	15	www.umich.edu
University of Virginia	22	www.virginia.edu
University of Wisconsin	36	www.wisc.edu
Villanova University	10	www.villanova.edu
Washington State University	28	www.wsu.edu

PRODUCT GUIDE

A Resource for Technology Leaders in Higher Education

	PROJECTORS
Mitsubishi XL25 ColorView XGA Projector	The Mitsubishi XL25 ColorView XGA projector shines 2300 ANSI lumens and is the world's quietest running near-silent at 27 db. It offers the first universal remote that controls a computer mouse and two video devices such as DVD players or VCRs.
Mitsubishi's XL5900U/LU LCD ColorView Projector	The first conference room and boardroom installation projector available in the market with a built-in motion-sensitive, anti-theft alarm for investment-protection.
Mitsubishi XL30 ColorView XGA Projector	The Mitsubishi XL30 ColorView XGA projector shines 3,000 ANSI lumens and is the world's quietest running near-silent at 27 db. It offers the first universal remote that also controls a computer mouse and two video devices such as DVD players or VCRs.
Dell—4100MP Projector	Dell's 4100MP Projector, available in Dell's online Higher Education Store, features bright 2200 lumens, a 2000:1 contrast ratio, and multiple PC input. Horizontal and auto vertical keystone, PIP and eco-mode.
Boxlight—XD-25m Projector	The new XD-25m Projector from Boxlight is small in weight and volume—it's about the size of a VHS tape. Multimedia presentation is available because of the video input. There is an on-board speaker. Has 1000 ANSI lumens, 2000:1 contrast ratio, digital computer input, DLP-XGA resolution.
Sharp Electronics—PG-A10S-SL Projector	Sharp Electronics' PG-A10S-SL projector is a multimedia projector that is perfect for the classroom. It is quiet, compact, uses economical power, and works on the PC, Mac, or workstation.
Sony—VPL-CX85 Projector	Sony's new projector, the VPL-CX 85, is a wireless portable projector that can be easily transported between meeting rooms or used as an entry-level install unit. It weighs less than nine pounds.
InFocus—X2 Projector	The new X2 Projector from InFocus has wireless capabilities and is compatible with LiteShow, the secure wireless solution from InFocus. Excellent video quality, with 1500 lumens, 2000:1 contrast ratio, automatic de-interlacing.
3M Multimedia Projector MP8790, XGA	The Multimedia Projector MP8790 features an Optional Wireless / Network Module. This projector as a high light output for a first-rate performance, special whisper mode, and a partial magnification function. Little space is required for installation.
	DIGITAL CAMERAS
Olympus—Stylus 410 Digital Camera	The Stylus 410 Digital Camera has the capability of filming QuickTime movies with audio, one of 10 shooting modes in its Virtual Dial. Ultra-compact, usable in all types of weather, made of metal.
	DISPLAY MONITORS
Gateway—42-inch Ultrabright Plasma Display	Gateway's new Ultrabright Plasma Display Screen features a Display Table Stand, Integrated NTSC Tuner, IR Remote Control, NTSC RF antenna, Composite Video, Component Video (2), S-Video, audio-in (6), audio-out, subwoofer, VGA, DVI In, and RS-232.

Gateway—50-inch HD-Ready Plasma Display	Gateway's new 50-inch HD (High-Definition)-Ready Plasma Display comes with a Display Table Stand, VGA, DVI In, RS-232, NTSC RF antenna, Composite Video, Component Video (2), S-Video, audio-in (6), audio-out, and subwoofer.
	DOCUMENT CAMERAS
ELMO—HV-100XG Notebook Digital Document Camera	The HV-100XG Notebook Digital Document Camera from ELMO offers XGA capture and output resolution, progressive scan at 20 fps for virtual real-time viewing, and an RGB PC connection for seamless laptop presentation switching.
EPSON—ELPDC04 High-Resolution Document Camera	This high-resolution document camera with true XGA resolution comes with a remote control, tilting camera head, 10x optical zoom lens, and has top lights that can be repositioned.
	ELECTRONIC WHITEBOARDS
CMG—Polyvision LT-6000 Interactive Whiteboard	CDW's Polyvision LT-6000 Interactive Whiteboard offers the precision of laser tracking on a durable ceramic steel surface. It captures anything written or drawn on the whiteboard to your computer so you can print, e-mail, fax, or upload your notes to the Web.
Mimio—MimioBoard Interactive Whiteboard	Mimio's MimioBoard Interactive Whiteboard enhances teaching and learning by allowing students to focus on class materials rather than just copying the notes. Class notes can be instantly printed, e-mailed, or posted to a class Web site.
Polyvision—Walk-and-Talk Presentation Series Interactive Whiteboard	Polyvision, a leading company in innovative visual communications solutions, has a Walk-and-Talk Presentation Series Interactive Whiteboard. Uses software of your choice, through PolyKey technology.
SMART Technologies—Rear Projection SMART Board Interactive Whiteboard 2000i	SMART Technologies' Rear Projection SMART Board Interactive Whiteboard 2000i is a product of DviT (Digital Vision Touch). By touching the large-screen display you can navigate Web sites, and control computer applications.
	PRESENTATION TOOLS
Canon—PR 200S - Presentation Assistant	The new PR 200S Presentation Assistant from Canon shows an immediate display just after a paper document or overhead transparency is scanned.
Extron—MediaLink Controller	The MediaLink Controller, MLC 206 AAP, from Extron mounts anywhere, even on surface mount boxes. Four single-space openings for Extron's Architectural Adapter Plates. Three relays for centralized control of room devices.
JVC—SR-MV30 DVD/S-VHS Dual Deck	Combining S-VHS/VHS, DVD recording and playback in a single unit eliminates the need for multiple components and the complexity of an external wiring.
RealNetworks—Helix Servers	Helix Servers allows you to deliver RealAudio 10 and RealVideo 10 to RealPlayers. Helix Universal Servers allow you deliver more than 50 data types including RealAudio 10 and RealVideo 10, Legacy versions of RealAudio and RealVideo, Windows Media, QuickTime, and MPEG4 to a variety of players.

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Howard Strauss

REFLECTIONS

ANOTHER LOOK AT EDUCATION TECHNOLOGY

What's Next: Course Creation Systems

Course management and learning management systems already do a fine job of organizing courses and providing the communications infrastructure for them. Portal-like features abound, course content can easily be plugged in, and channels or modules can be added to do just about anything from equation editing to voice annotation. All the major players have good systems that are getting evolutionarily better. While there is still a lot of important and interesting tweaking to be done, learning management systems only *manage* courses that have already been developed. It's time to consider a course *creation* system (CCS); software that will assist in the creation of courses that could be dropped into a learning management system.

The first step in creating or refreshing a course is to do some planning. Like a project, a course has a start time, end time, events, resources, goals, and a critical path. A CCS would include features to assist with all the project management aspects of a course. It would include course templates with information imported from university information sources such as the academic calendar, exam schedules, room assignments, and so forth. For a course previously taught, the planning structure would be imported and just edited. Someone building a course would first define each event in the course. The structure, topics, goals, teaching plan, readings, and assignments of each lecture and lab would be specified. Where appropriate, due dates, weightings, and other information would be specified. Contingency plans such as make-up exams would be considered.

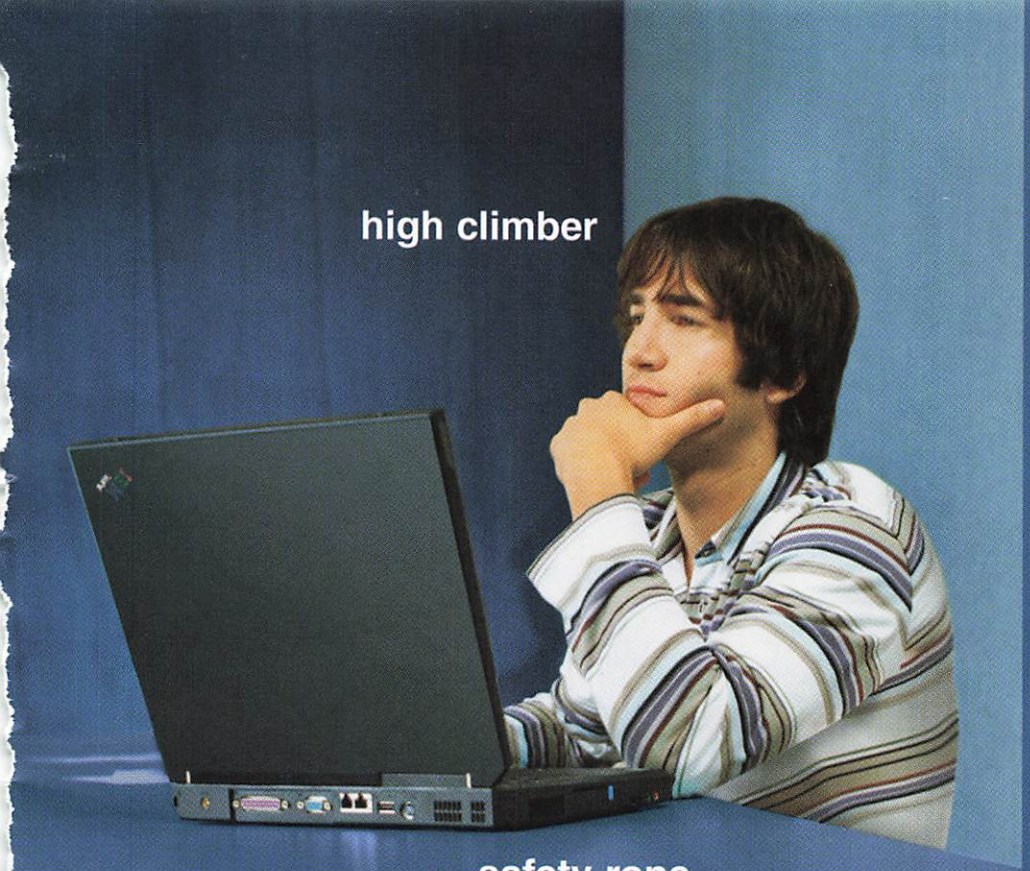
With an outline of the course specified, it would be possible to check the timing, flow, and logic of the course and move things around to improve it. Does a lab expect students to do something not yet covered in class? Then maybe move the lab, change it, alter a lecture, or assign some reading to prepare students for the lab, or in some other way fix the error. Is the material covered in each class balanced? Is there too much material being squeezed into the last few lectures? Abe Lincoln said, "Give me six hours to chop down a tree and I will spend the first four sharpening the axe." Spending time planning a course will make teaching easier and will improve learning.

Will busy faculty find the time to learn and use a CCS? Most won't—unless there is *no* learning curve. One way to make that happen is to mimic the way TurboTax allows complete tax novices, such as me, to fill in arcane tax forms and conform to tax laws that I have no hope of ever understanding. TurboTax uses a few tricks that would be ideal for a CCS. Its interview process goes through the most complex tax return by asking a series of simple questions. When it already has information, from a previous course—I mean tax form—for example, it just displays that for confirmation or alteration. You can quit at any time and it will start up exactly where you left off. You could work on taxes for several people and it will pick up where you have left off for each one. You can go to a particular part of the interview, skip a part, or just go to a form and fill it in yourself. No matter how information is entered it is incorporated into the final result. At the end, TurboTax checks for possible errors. I can imagine the CCS warning, "You have no midterm exam," or "Your course meets during spring break!" The CCS would look at the quality of a course to ensure it meets pedagogical standards and the standards of your department, which you could follow or ignore.

A CCS won't only do project management. An onerous task in creating course content is searching for

continued on page 58

Illustration by Peter Lacalamita



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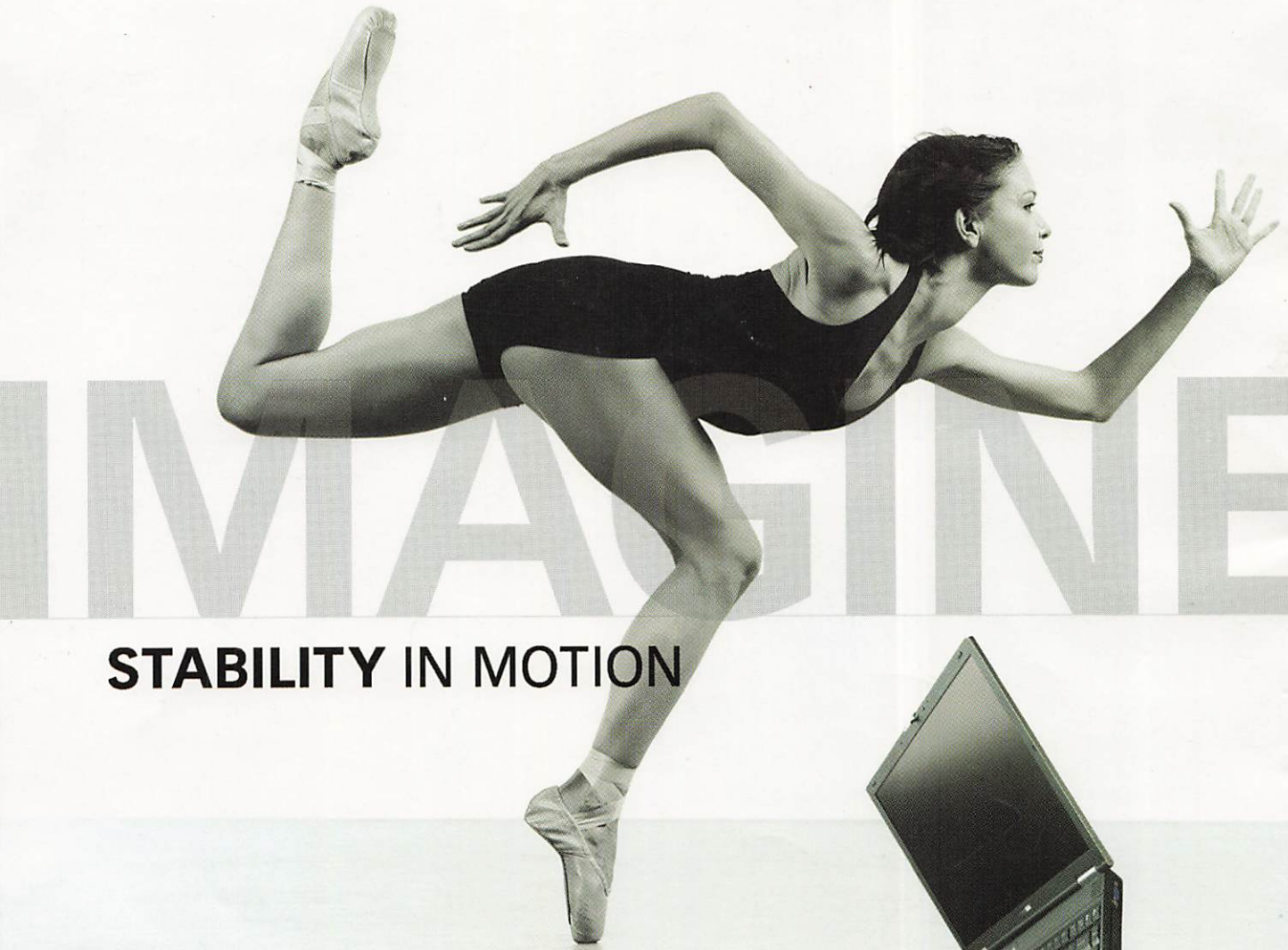

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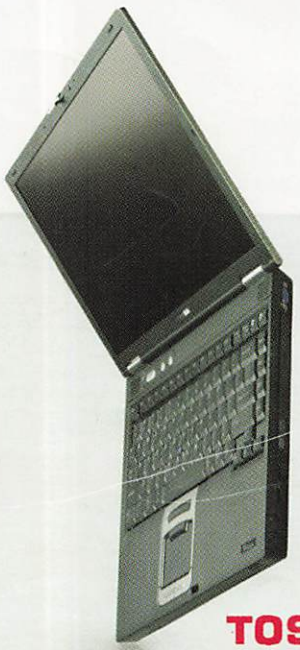

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